

# MySignals SW

eHealth and Medical IoT Development Platform  
Technical Guide



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# 1. MySignals Software Development Platform

## 1.1. General and safety information

The following list shows just some of the actions that produce the most common failures and warranty-voiding cases.

Failure to comply with the recommendations of use will entail the guarantee cancellation.

### Software:

- Update firmware version only using Libelium Smart Devices App . If a different Software is used, MySignals can be damaged and can become unresponsive. This use will void the warranty.
- Use only MySignals Web Server Application or MySignals Mobile App in order to configure and setup your account and device.
- Do not unplug any connector while uploading code. MySignals can become unresponsive. This use will void the warranty.

### Hardware:

- Do not handle black stickers seals on both sides of the enclosure (Warranty stickers). Their integrity is the proof that MySignals has not been opened. If they have been handled, damaged or broken, the warranty is void.
- Do not open MySignals in any case. This will automatically make the warranty void.
- Do not handle the four metallic screws of MySignals.
- Do not submerge MySignals in liquids.
- Do not place nodes on places or equipment where it could be exposed to shocks and/or big vibrations.
- Do not expose MySignals to temperatures below -10°C or above 50°C.
- Do not connect any sensor not provided by Libelium.
- Do not power MySignals with other power sources than the original provided by Libelium.
- **Connect any sensor not provided by Libelium only under your responsibility.**

The document "General Conditions of Libelium Sale and Use" can be found at:

[www.libelium.com/development/waspmove/technical\\_service](http://www.libelium.com/development/waspmove/technical_service)

## 1.2. Conditions of use

### General:

- Read the "General and Safety Information" section carefully and keep the manual for future reference.
- Read carefully the "General Conditions of Sale and Use of Libelium". This document can be found at: [www.libelium.com/development/waspmove/technical\\_service](http://www.libelium.com/development/waspmove/technical_service). As specified in the Warranty document the client has 7 days from the day the order is received to detect any failure and report that to Libelium. Any other failure reported after these 7 days may not be considered under warranty.
- Use MySignals in accordance with the electrical specifications and in the environments described in the "Electrical Data" section of this manual.
- MySignals and its components and modules are supplied as a final product. This product has an enclosure to protect it from dust, humidity and other environmental interactions.
- Do not place MySignals in contact with metallic surfaces; they could cause short-circuits which will permanently damage it.

**Remember that inappropriate use or handling of MySignals will immediately invalidate the warranty.**

If you have any doubt you can post your question at: <https://www.libelium.com/forum/>

## 1.3. Disclaimer

MySignals Products are not medical devices or health-care services, nor are they intended for medical diagnosis, cure, mitigation, treatment, advice or prevention of disease. MySignals Products are not finished products, so they are not intended to be purchased by End Users, but by developers, researchers and OEM Customers. Read our [Terms & Conditions](#) before buying for a complete understanding.

Access to the Terms & Conditions at:

<https://libelium.com/downloads/MySignals-Terms-and-Conditions.pdf>

## 2. General view

[MySignals](#) is a development platform for medical devices and eHealth Applications. You can use MySignals to develop your eHealth web Applications or even to add your own sensors to build new medical devices.

MySignals allows you to measure more than **20 biometric parameters** such as pulse, breath rate, oxygen in blood, electrocardiogram signals, blood pressure, muscle electromyography signals, glucose levels, galvanic skin response, lung capacity, snore waves, patient position, airflow and body scale parameters (weight, bone mass, body fat, muscle mass, body water, visceral fat, Basal Metabolic Rate and Body Mass Index). These broad sensing portfolio makes MySignals the most complete eHealth platform in the market.



Figure: My Signal Software Development Platform

All the data gathered by MySignals is encrypted and sent to the user's private account at Libelium Cloud through WiFi or Bluetooth. Data can be stored in the Libelium Cloud or being sent to a third party Cloud Server. The data can be visualized in a tablet or smart phone with Android or iPhone Apps.

Libelium offers an API for developers to access the information. The **Cloud API** allows to access to the user's private account and get the information previously stored to be visualized in a third party platform.

You can find all the info at: <http://www.my-signals.com>

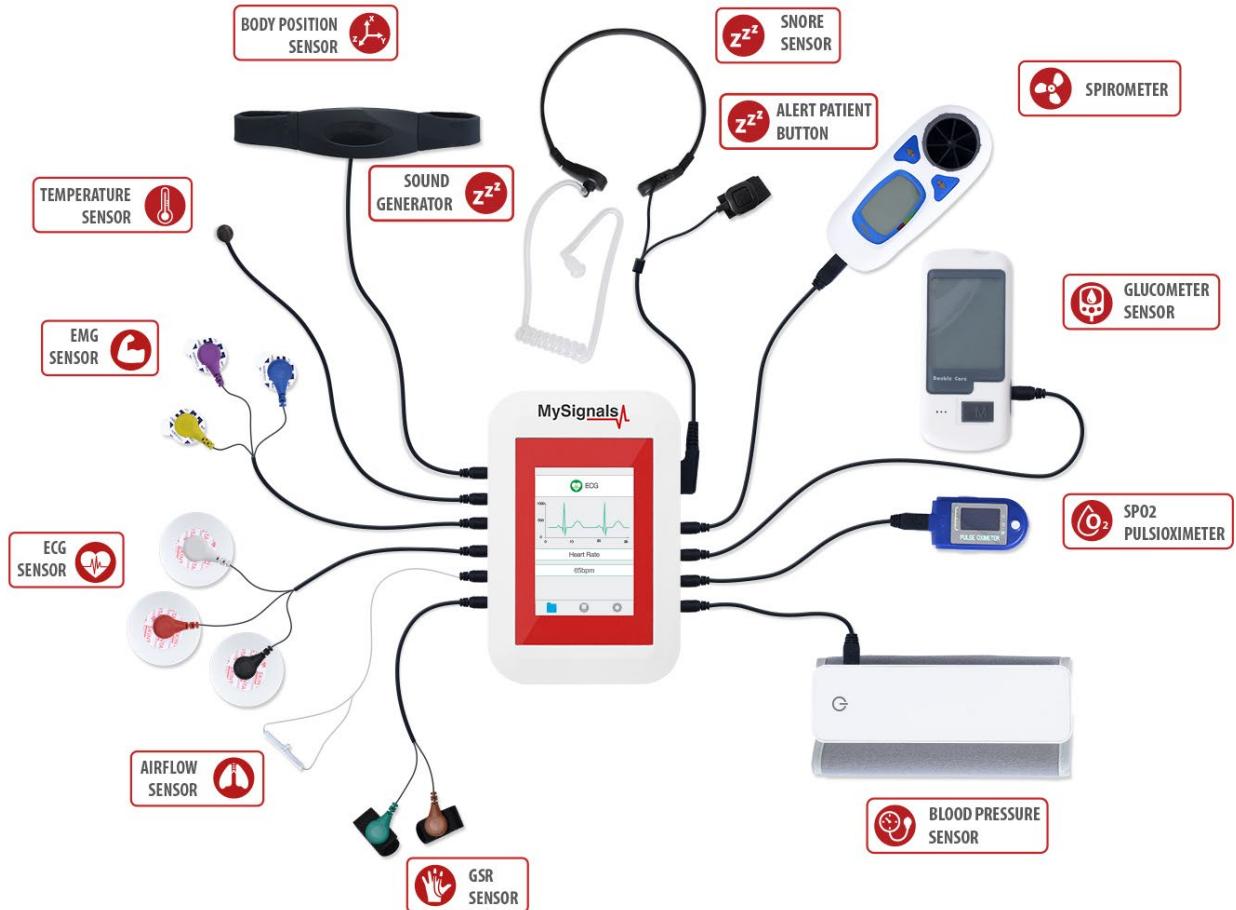


Figure: My Signal Software Development Platform with sensors

## 2.1. Specifications

MySignals allows you to measure 20 different biometric parameters such as pulse, breath rate, oxygen in blood, electrocardiogram signals, blood pressure, muscle electromyography signals, glucose levels, galvanic skin response, lung capacity, snore waves, patient position, airflow and body scale parameters (weight, bone mass, body fat, muscle mass, body water, visceral fat, Basal Metabolic Rate and Body Mass Index). These broad sensing portfolio makes MySignals the most complete eHealth platform in the market.



Figure: My Signal Software Development Platform

- Monitoring EMG signals.
- Monitoring ECG signals.
- Monitoring Snore signals.
- Airflow control of user.
- Body temperature data. Wired version.
- Galvanic skin response measurements.
- Body position detection.
- Pulse and oxygen functions. Wireless or wired version.
- Blood pressure control device. Wireless or wired version.
- Glucometer monitor. Wireless or wired version.
- Spirometer monitor.
- Body Scale. Wireless version.
- Alarm button. Wireless version.

This information is used to monitor in real time the state of a user or to get sensitive data in order to be subsequently analysed for medical diagnosis. Biometric information gathered is wireless sent using two connectivity options available: Wi-Fi or Bluetooth Low Energy 4.0.

Data can be visualized in standalone mode, sent to the Cloud in order to perform permanent storage or visualize and storage in real time by sending the data directly to a Smartphone. iPhone and Android Applications have been designed in order to easily manage and storage the user's information.

With CE / FCC / IC Certifications what makes it perfect to be used in any kind of project.

**NOTE:** MySignals Software Development Platform is a hardware closed device. It is ready to be used as a web and mobile App's development platform with the sensors distributed by Libelium. If you want to integrate new sensors (wired, BLE, BT) or program the device with a personal firmware use the [MySignals HW model](#).

## 3. Notes

### 3.1. Important notes

**1º** - In order to keep the MySignals enclosure clean and without any mark we recommend to place it into the bag and add on top the chamois cloth provided before closing the bag.



**2º** - As a new product line we are updating the firmware and mobile App's every week so please:

- Update regularly the MySignals Firmware to the last version. Go to the section "*MySignals Firmware*" of the guide for more info.
- Update regularly the version of the Android / iOS App.

**3º - IMPORTANT: DO NOT UNPLUG MySignals WHILE IT IS BEING UPGRADED OR IT MAY BE RENDERED USELESS! (THIS CASE IS NOT COVERED BY THE WARRANTY).**

**4º** - MySignals includes a stick to navigate through the menu options of the touchscreen. Please use it for a correct function of the device interface.



**5º** - The Firmware of MySignals SW manages all the sensors at the same time and monitors the response of the screen and the touchscreen. For this reason sometimes during the measurement of different sensor like blood pressure or other wireless sensors it will be able to perform one action at the same time, you have to wait it to finish before being able to navigate or interact with the screen again.



**6º** - After the first time that you want to use WiFi mode a BLE connection with MySignals SW is needed if you want to use Server Connection Mode and MySignals Web Server Application because MySignals Mobile App send all the user account and configuration information using Bluetooth Connectivity.

Then you can introduce your WiFi SSID name and your WiFi password in Offline mode in order to save this information to MySignals.

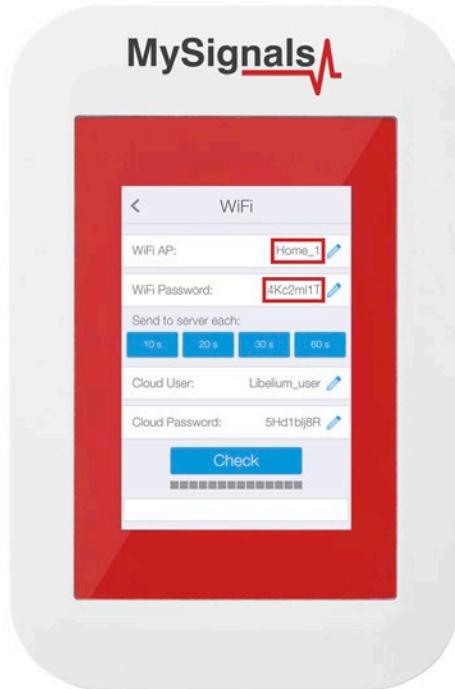
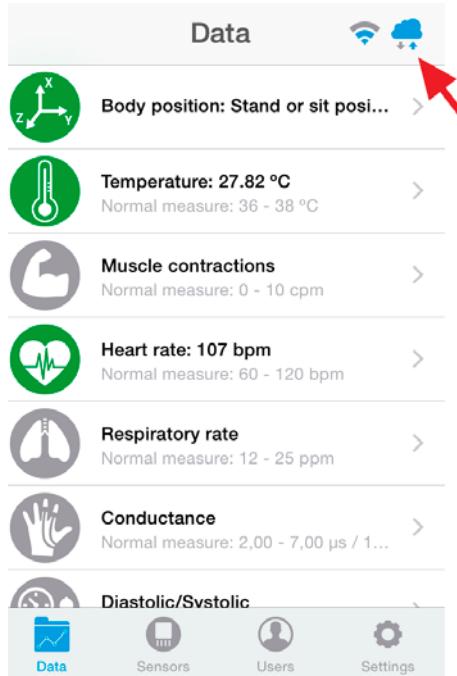


Figure: WiFi settings

In the same section you can use the CHECK button in order to test the WiFi connection. MySignals will show you the results of the connection test

**7º** - At any time you can Activate / Deactivate the synchronization of the information being sent to your Cloud Account by just pressing the Cloud icon on the top right corner.



**8º** - How can I see values older than one month in my Cloud account? MySignals Cloud Web Service allows currently to see the complete historical data of any of the users.

If you want to access to this data, you can also use the Cloud API to get the sensor values of a member.

If you have any doubt just write a post in the [MySignals forum](#).

**9º** - In the "Detail view" only information coming from that specific sensor is received and sent to the Cloud. If you want to receive and store information coming from many sensors at the same time you should use the "General view" screen.

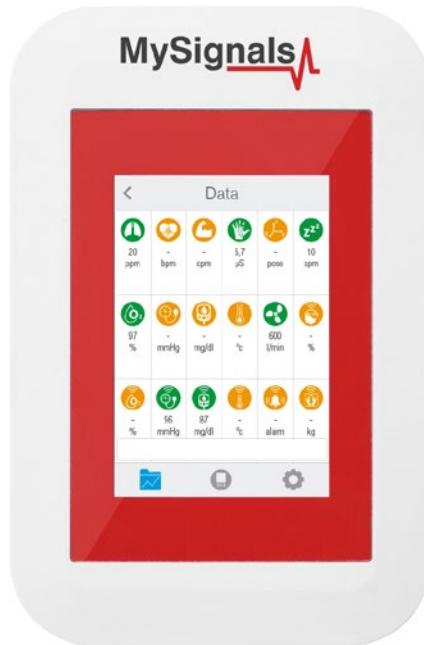


Figure: General view



Figure: Detail view

**10º** - In September 2017 we have released new Firmware, Apps and Cloud versions that allow to record continuous waves and send them to record continuous waves and send them to the Cloud (in Server Mode). You can record 15 or 30 seconds of the data measured in detail mode of **ECG**, **EMG**, **Snore** and **Airflow**.



**11º** - You can select an upload to the cloud time interval in WiFi setting of 10, 20, 30 or 60 seconds.

**12º** - BLE sensors are compatible with the mobile App.

**13º** - In order to make the MySignals App send to the Cloud you need:

- Have one Department created.
  - Have one user created and linked to one.
  - Department In the App to to Users, click on one and press "Select this user".
- Make sure the "Cloud" icon is active (upper right corner of the App).

**14º** - Connect the ECG Electrodes to the ECG sensor cables before placing them in the user body.



**15º** - The ECG signals need to be measured with the user lying down on the bed or stretcher.



## 3.2. FAQ

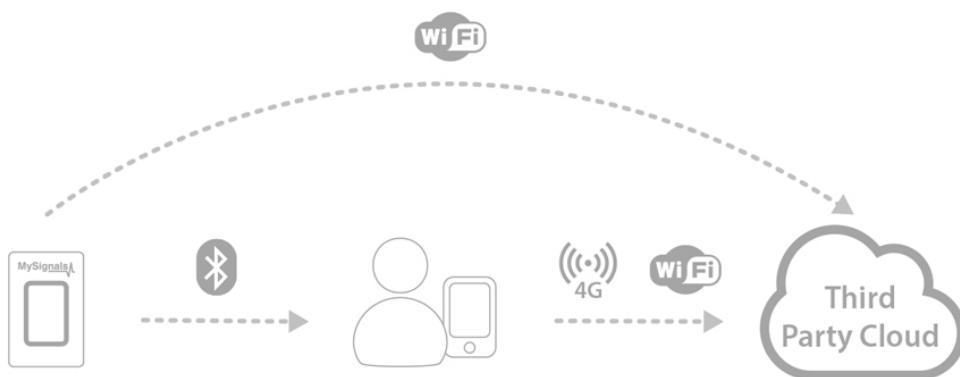
### - Can MySignals work against our own cloud or a third party server?

Yes. You can send the information coming from MySignals to a third party Cloud server by three ways:

**1º** - Migrating the information stored in the Libelium Cloud to a third party Cloud server easily using the API Cloud provided.



**2º** - Using directly the WiFi radio (HTTP, TCP/IP, etc). This last option just for MySignals HW.

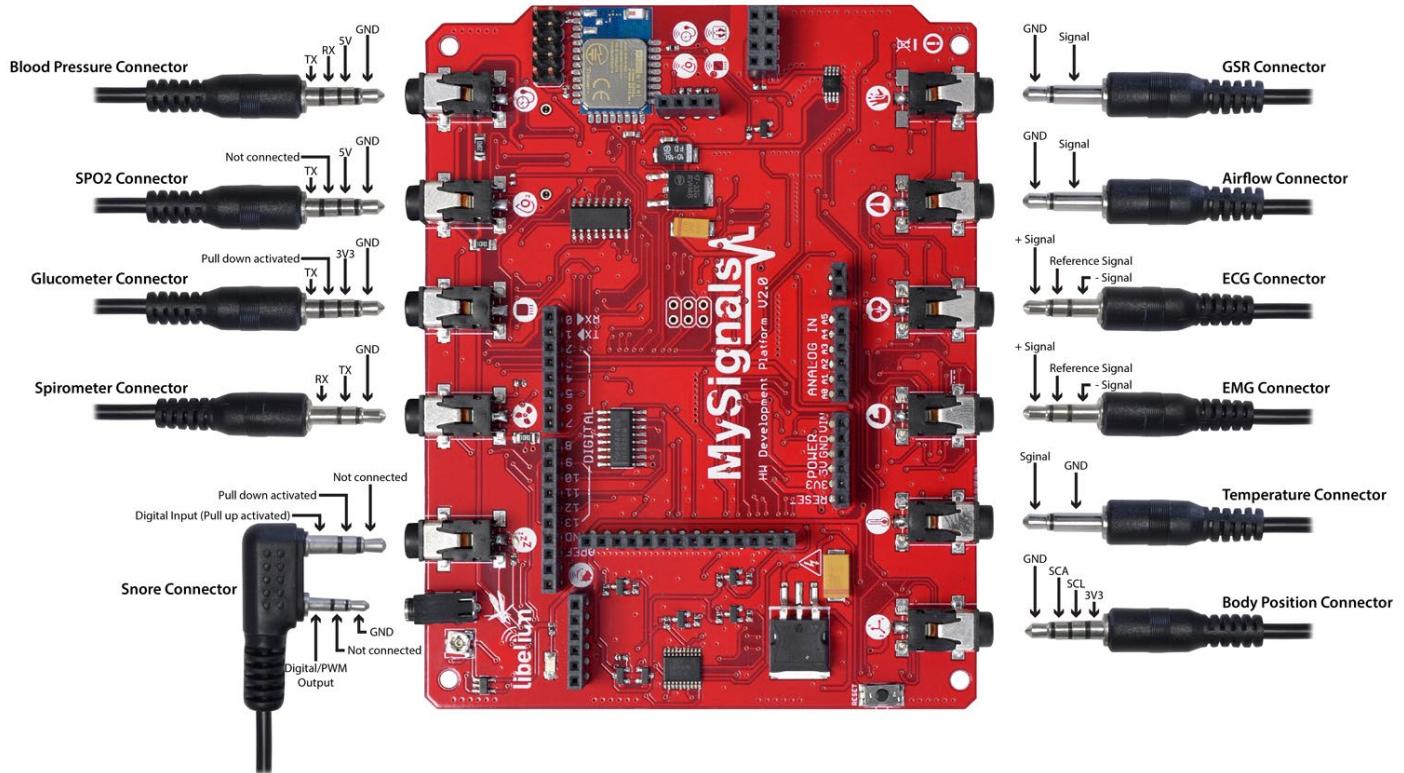


### - Can I use all the sensors at the same time?

In the case of MySignals SW, yes you can. In the case of MySignals HW the Arduino processor is limited, so you can not manage all the sensors, wireless communication and others features at the same time. You should select a correct combination of the options available. Check the documentation for that.

## - Can I use my own sensors?

In the case of MySignals HW we provide the sensor pinout. You can use it to integrate your own sensors. WiFi, BLE, and BT2.0 connectivity is available too in order to integrate new wireless sensors.



**Blood Pressure Connector**  
 - UART Communication: RX/TX  
 - 5V Power Supply  
 - Voltage level: 5V

**SPO2 Connector**  
 - UART Communication: only TX  
 - 5V Power Supply  
 - Voltage level: 5V

**Glucometer Connector**  
 - RS232 Communication: RX/TX  
 - Voltage level: up to 12V

**Spirometer Connector**  
 - UART Communication: RX/TX  
 - 3V3 Power Supply  
 - Voltage level: 5V

**Snore Connector**  
 - Analog resistive sensor  
 - Digital input  
 - Digital/PNP output  
 - Input Range: 0–10KΩ  
 - Voltage level: 5V

**GSR Connector**  
 - Analog Resistive Sensor  
 - Input Range: 10–200KΩ  
 - Voltage level: 3V3

**Airflow Connector**  
 - Analog Resistive Sensor  
 - Input Range: 0–1KΩ  
 - Voltage level: 3V3

**ECG Connector**  
 - Analog Differential Sensor  
 - 3 derivations  
 - Voltage level: 5V

**EMG Connector**  
 - Analog Differential Sensor  
 - 3 derivations  
 - Voltage level: 5V

**Temperature Connector**  
 - Analog resistive sensor  
 - Input Range: 0V–3KΩ  
 - Voltage level: 3V3

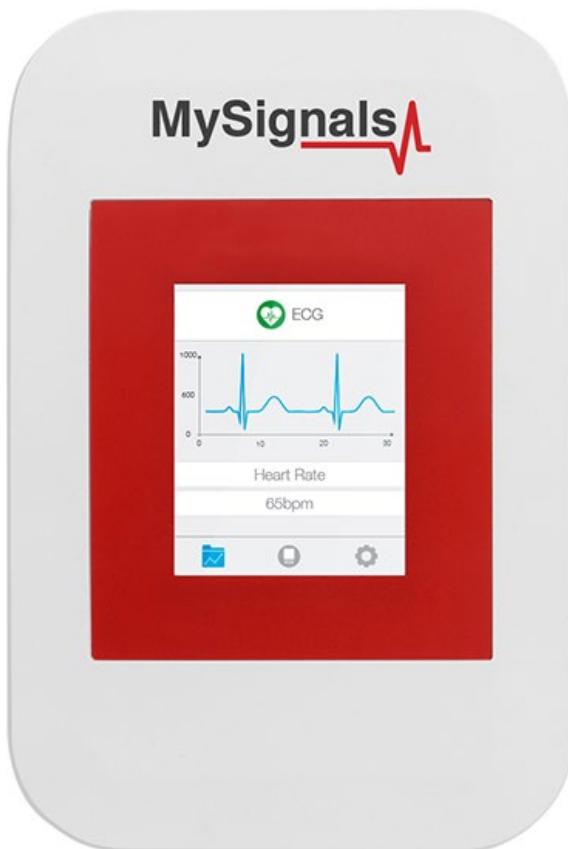
**Body Position Connector**  
 - I2C communication  
 - 3V3 power supply  
 - Voltage level: 3V3

## 3.3. Features of the New version of MySignals

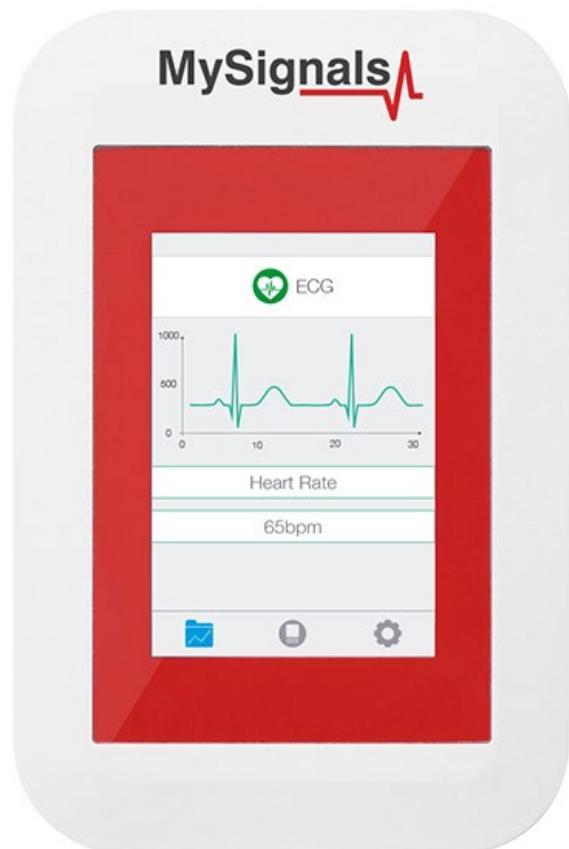
### 3.3.1. New TFT screen

The new version of MySignals includes a new TFT screen with a 30% longer screen diagonal (3.5" vs 2.4"), which means an **increase of 100%** of the real touch surface area, making the gathered data easier to read. The new navigation touch interface allows **instantaneous transitions** between menu screens offering a better user experience.

First Version of MySignals SW  
TFT Screen 2'4"



New Version of MySignals SW  
TFT Screen 3'5"



### 3.3.2. New sensor added

A new Bluetooth Low Energy (BLE) sensors has been added to MySignals: The Alarm / Emergency Button.

#### Alarm / Emergency Button

Emergencies can happen at any time and anywhere. The Alarm / Emergency Button provides immediate access to assistance with just the touch of the button.

This call button can be worn as a help pendant around your neck or as an alert watch button around your wrist. Unlike other systems or a cell phone, you don't have to think about what numbers to dial, which buttons to press, or if it's charged up. Your medical alert button is always ready.



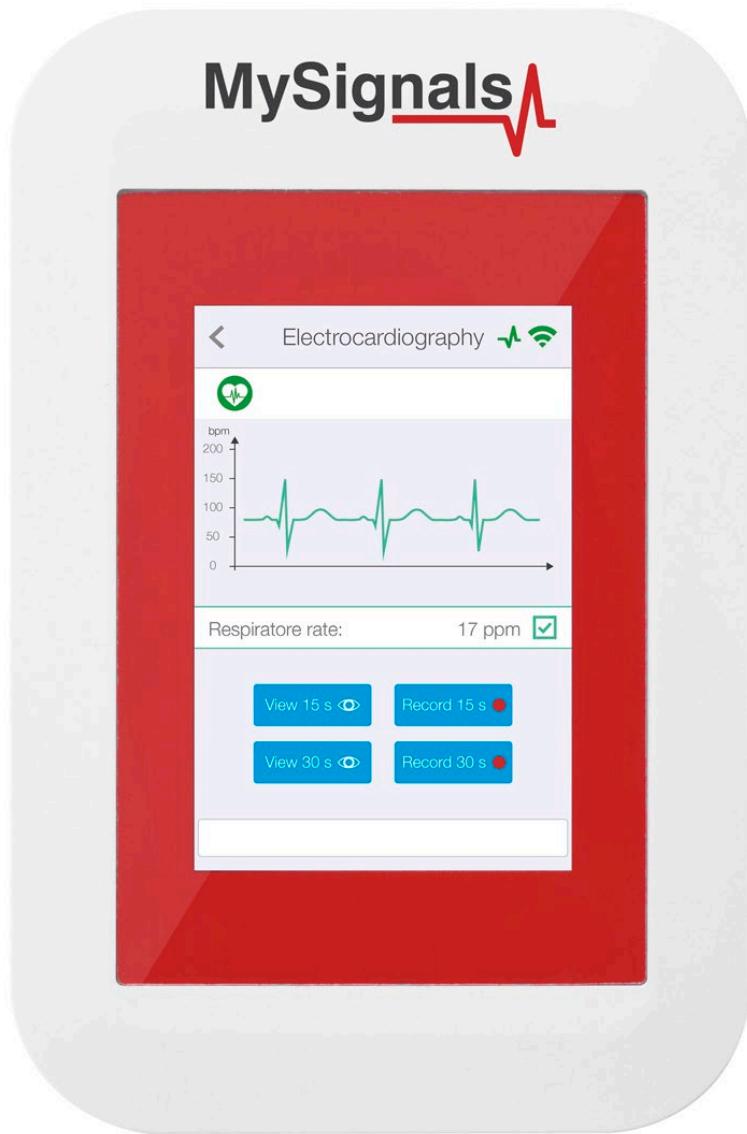
### 3.3.3. New security features

In this new version it has been developed a whole new custom WiFi module firmware, adding the functionality of SSL secure communications HTTPS to the Libelium cloud or the client's private Cloud platform. This security layer is added on top of the the symmetric encryption AES 256 that is performed by MySignals in the Application layer (it is present in new and old versions of the product).



### 3.3.4. New continuous wave record mode

With this new MySignals revision, new App and Cloud versions have also been developed that allow to record continuous waves and send them to the Cloud (in WiFi Mode). You can record 15 or 30 seconds of the data measured in detail mode of ECG, EMG, Snore and Airflow.



**NOTE:** This feature was already present in the current version of MySignals sold from February 2017.

### 3.3.5. Adding new Bluetooth and BLE sensors

In this new version it is possible to acquire new Bluetooth and BLE sensors after the purchase of the MySignals since a new pairing functionality has been added to the interface in a simple and intuitive way.



### 3.3.6. More robust hardware usability

With the new version of MySignals you can connect or disconnect any sensor at any time even if MySignals is running. In other words all sensors allow hot plug behavior.



**NOTE:** This feature was already present in the current version of MySignals sold from February 2017.

### 3.3.7. 20 New Video Tutorials (step by step)

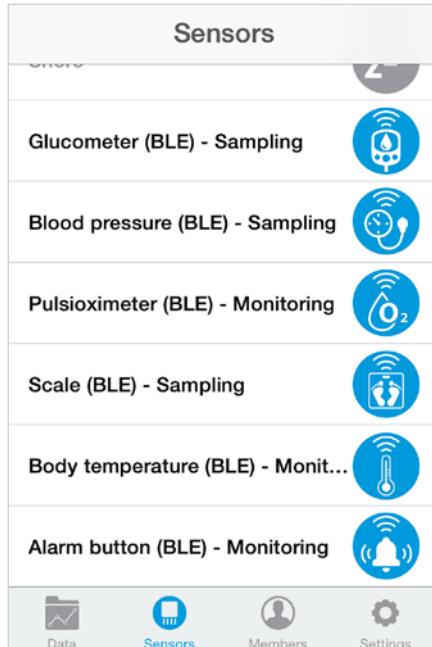
Twenty new video tutorials with step-by-step settings and instructions allow a quick test of the platform in just a few minutes. The video tutorials show how to use all the sensors in stand alone mode along with the usage of the Bluetooth and WiFi modes to send the information from MySignals to the Cloud.



[https://www.youtube.com/watch?v=6bLDYB9pPrI&list=PLZqFwTtl\\_Y--TsF2W2xqj1SR9l0A1OMdD](https://www.youtube.com/watch?v=6bLDYB9pPrI&list=PLZqFwTtl_Y--TsF2W2xqj1SR9l0A1OMdD)

### 3.3.8. New Android / iOS App

With the new Android / iOS App release, all the Bluetooth and BLE sensors can be used at the same time against the App in the Bluetooth Connection mode. This feature was not possible in earlier versions of the mobile App.



## 4. Hardware



Figure: Top view of MySignals Software

### Included on MySignals device:

- Micro-Controller Circuit
- Power Supply Circuit
- Sensor Circuits
- Bluetooth Low Energy module
- WiFi module
- Jack Sensor Connectors

*In order to keep the MySignals enclosure clean and without any mark we recommend to place it into the bag and add on top the chamois cloth provided before closing the bag.*



## 4.1. Electrical Data

The MySignals Software can be powered by an external power supply.

### General power supply

Operating Current	2 A
Operating Voltage	5V
Input Voltage (recommended)	7-9 V
Input Voltage (limit)	7-12 V

### Specific power supply

DC Current per I/O Pin	20 mA [Max]
DC Current for 3.3V	1 A [Max]
DC Current for 5V	1 A [Max]
Input Voltage (limit)	7-12 V

Plug in /out the power supply adapter included with MySignals to turn ON or OFF the device. Make sure that the power adapter is placed indoors



Figure: MySignals Software powered

Plug it into the corresponding power supply connector. Power supply unit is included with MySignals. Do not use any third party power supply with it. You can see all the information about the power supply in the label included in MySignals device.

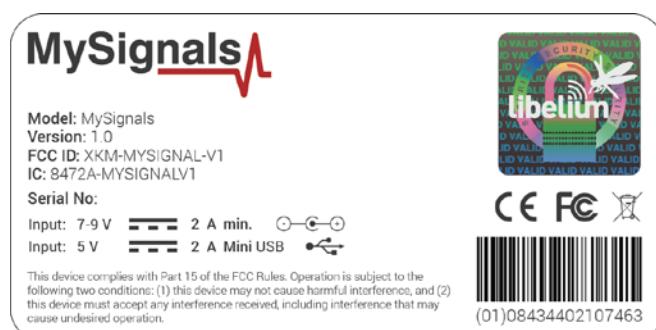


Figure: Certification MySignals label

## 4.2. USB Data Transfer

This connector is used to update code into MySignals with a male USB to male Mini USB cable provided by Libelium. Just connect one side of the cable to this connector, removing protection cap from MySignals and connect the other side to a PC to update a code.



Figure: MySignals Software USB connector

MySignals include a protective cap for this connector. When uploading processes are finished, do not forget to use again protection cap to keep the connector clean from dust.



Figure: MySignals Software with protective cap

## 4.3. Data Interface

Data can be visualized by 3 different modes:

- Standalone mode: using the basic graphic TFT Integrated in the device.
- Mobile App'S: using the native Android / iOS connectivity to send all the data to the smartphone.
- Web Server: you can also access to the history of the information gathered by connecting to the Cloud through a web browser or using the native iOS / Android App's.



Figure: MySignals Software Development Platform standalone with App and Server

MySignals includes a stick to navigate through the menu options of the touchscreen. Please use it for a correct function of the device interface.



## 4.4. Wireless Communications

MySignals Software have two connectivity options available integrated: Wi-Fi or Bluetooth Low Energy 4.0.



Figure: MySignals Software Development Platform with Wireless Communication logos

Figure: Data may be sent directly to the Cloud via WiFi or using your smartphone (BLE)

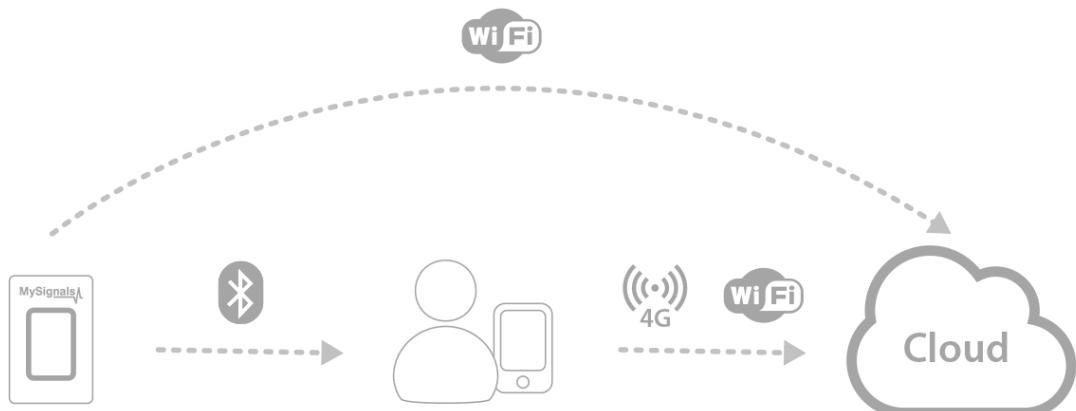


Figure: Connectivity MySignals diagram

The data gathered by MySignals is encrypted and sent to the developer's private account at the Libelium Cloud. (Developers may use their own Cloud too to store the information. More info in the API section below).

## 5. Software

*As a new product line we are updating the firmware and mobile App's every week so please:*

- *Update regularly the MySignals Firmware to the last version. Go to the section "MySignals Firmware" of the guide for more info.*
- *Update regularly the version of the Android / iOS App.*

### 5.1. MySignals Firmware

The MySignals Software Development Platform includes a high level firmware that control all the features of the device at the same time.

#### 5.1.1. Version 1.0.1 – Release Notes

MySignals Software Development Platform Firmware.

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<http://www.libelium.com>

September 26, 2017

#### Features:

- 3 communication modes: standalone, WiFi connectivity and BLE connectivity
- 3 monitoring modes: standalone, Smartphone Mobile App and Web Server Application
- In the communication link layer: AES 128 encryption for BLE and WPA2 and AES 256 encryption for Wifi.
- Full integration of 18 sensors.
- Graphic interface upgraded with detail and general modes.
- Touchscreen control integrated.
- Specific MySignals BLE profile.

## 5.2. MySignals Mobile App

The Bluetooth Low Energy module integrated may perform direct communications with iPhone and Android devices.

We have developed the Application MySignals, for both iPhone and Android platforms. The Application may be also downloaded from the official App markets.

Official App markets URL's:



<https://itunes.apple.com/app/id1138747630>



<https://play.google.com/store/apps/details?id=com.libelium.MySignals>

*In order to make the MySignals App send to the Cloud you need:*

- *Have one Department created.*
- *Have one user created and linked to one Department.*
- *In the App to to Users, click on one and press "Select this user".*
- *Make sure the "Cloud" icon is active (upper right corner of the App).*

MySignals device will send data to the mobile App in case the BLE mode is enabled. In this case the App will upload the data to the Cloud. The App can also be used to navigate through the users history at the Libelium Cloud.



Figure: App logo

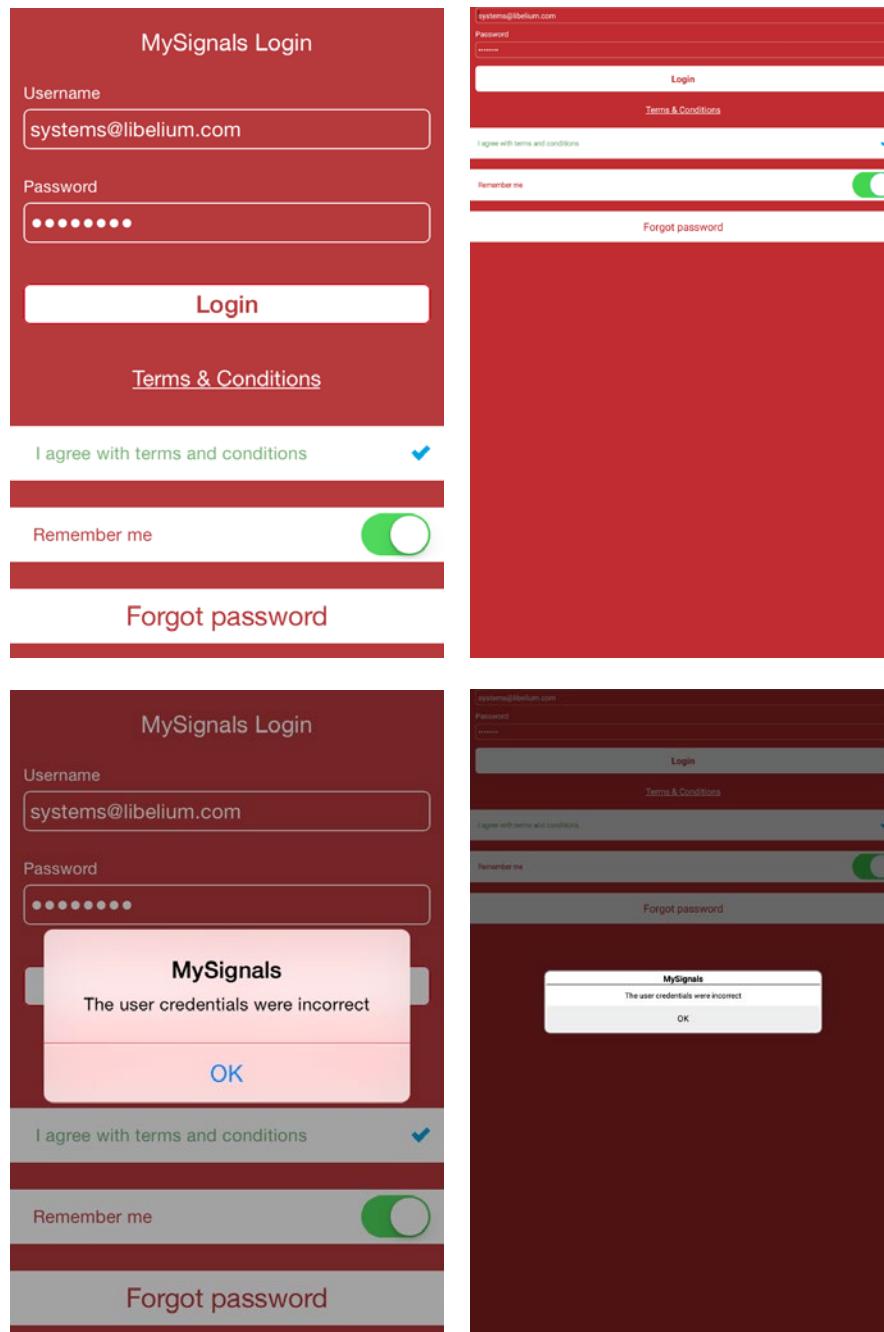
Also consider this straightforward advices before using the application with the Cloud Service :

- Make sure that you have a valid cloud user credential to perform login on mobile application (for more information please refer <http://www.libelium.com/development/cloud-services/documentation/services-cloud-manager-technical-guide/>).
- You have to register a device with a license.
- Once you have registered a device with a license it is not possible to register another device with the same license. (for more information please refer <http://www.libelium.com/development/cloud-services/documentation/services-cloud-manager-technical-guide/>).

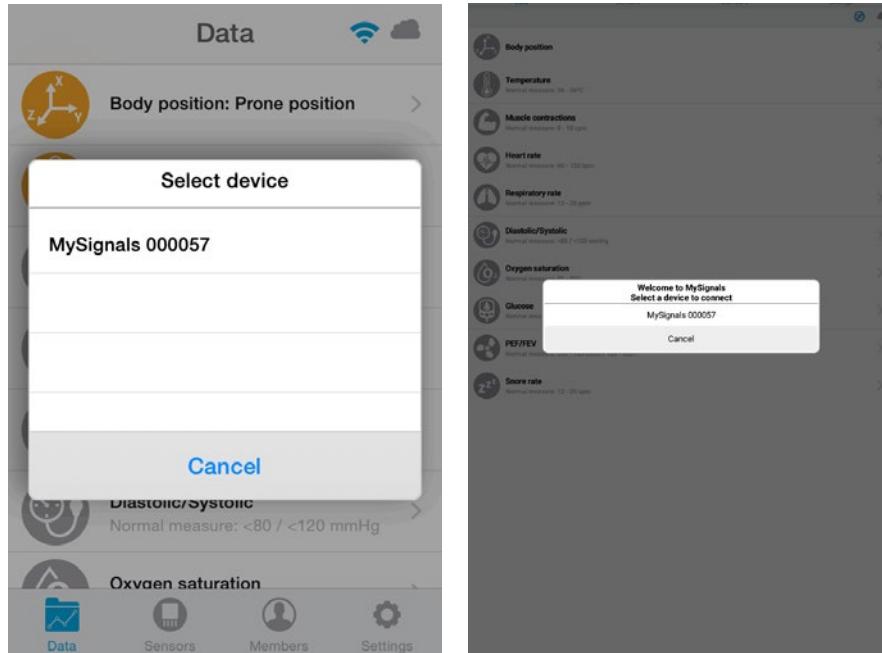
## 5.2.1. Register a device with a license

This is a simple and internal process that took place on the mobile application. First of all make sure you have a valid cloud credentials because without these credential the user is not able to login on cloud or mobile application, among other cloud services.

Before start make sure your MySignals device is active and it is set to bluetooth mode. Open the mobile application and enter your credentials, make sure you have read and accept the terms and conditions and press login button, if you have problems on login the system will warn about the problem:

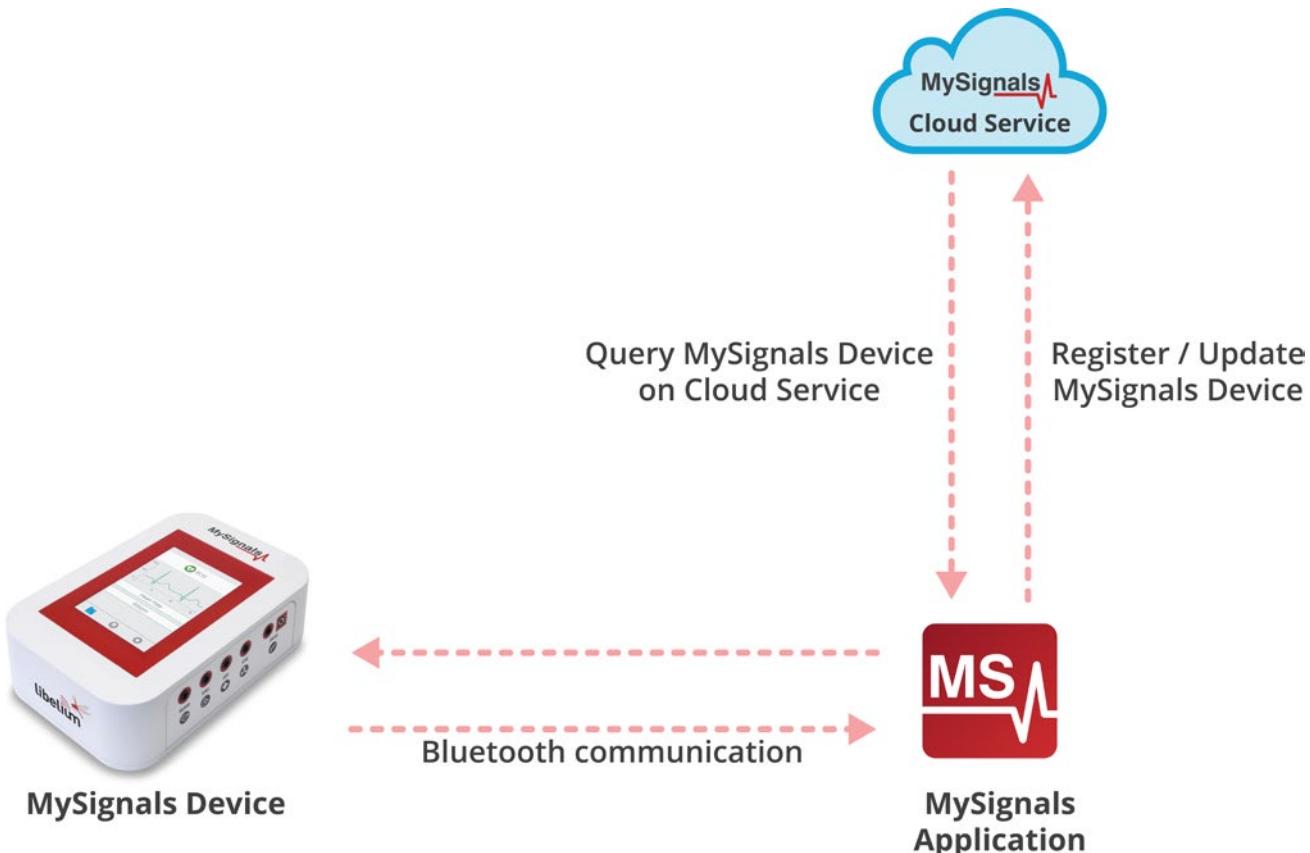


After login, if you have already selected a MySignals device skip this paragraph, if not continue reading. If the user had not selected a MySignals device to connect, after login, a popup message will prompt with a list of available MySignals device to connect.



Once the user selects a MySignals device the registration of a new device with a license is a transparent process for the user. After a properly bonding between the mobile application and the MySignals device the registering process starts.

First, the mobile application looks for the MySignals device in the cloud, if this device is not registered it creates a new device for the user, if this device already exists it update the information for this device. The account can only register one MySignals device. This process can be represented with the following scheme:



## 5.2.2. Encryption and bonding

In older Bluetooth standards, the user needed to pair with a remote device before connecting it. On the Bluetooth 4.0 standard, the user can connect to other remote BLE devices without any pairing process. Even the user can use advertisements to send a few amount of data, as it has been described in previous sections. However, these processes are not secure.

The Bluetooth 4.0 standard uses **AES-128 link layer encryption**. The encryption can be used in the connection processes to make them secure. The encryption of the connection can be started using a dedicated command. providing the handler of the established connection. The handler is usually zero, unless other connections are enabled.

On the other hand, the bonding processes are the long term storage of encryption keys used by each BLE module. Keys are defined as 6 digit numbers with a range from 000000 to 999999. Starting a connection with bonding will imply next steps:

- 1. MySignals SW advertises
- 2. MySignals App detects advertisements of MySignals SW
- 3. MySignals App starts a connection with MySignals SW
- 4. MySignals App request bonding
- 5. Both nodes exchange keys: bonding key Appear in MySignals SW TFT screen.
- 6. Both nodes store keys for future usage

## 5.3. Libelium Smart Devices App

Libelium Smart Devices App is the Java Application used to upgrade the FW of MySignals SW.

Download at:

[http://downloads.libelium.com/smart\\_device\\_app/SmartDeviceApp\\_linux64.zip](http://downloads.libelium.com/smart_device_app/SmartDeviceApp_linux64.zip)

[http://downloads.libelium.com/smart\\_device\\_app/SmartDeviceApp\\_macosx64.zip](http://downloads.libelium.com/smart_device_app/SmartDeviceApp_macosx64.zip)

[http://downloads.libelium.com/smart\\_device\\_app/SmartDeviceApp\\_windows32.zip](http://downloads.libelium.com/smart_device_app/SmartDeviceApp_windows32.zip)

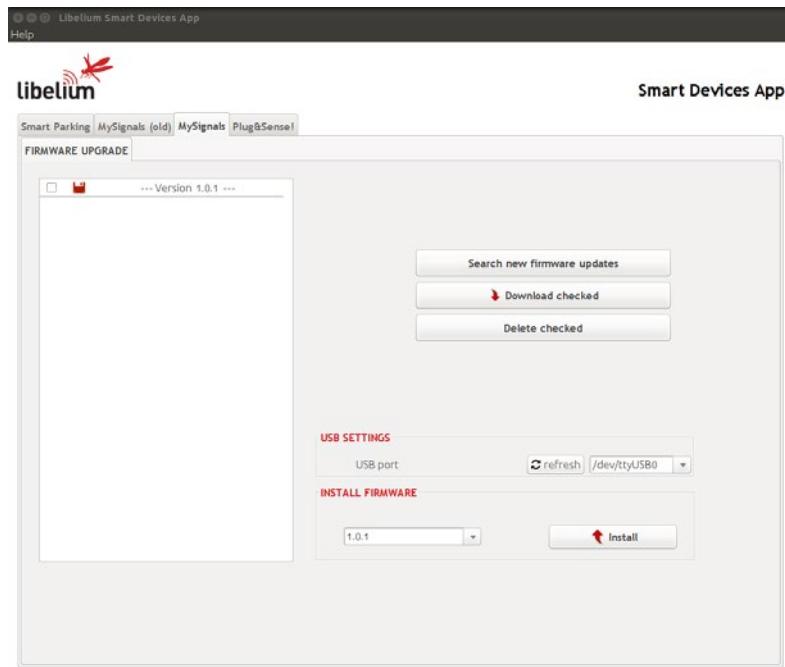


Figure: Updater Tool Interface

Follow the step-by-step instructions for setting up the Libelium Smart Devices App on your computer and connecting it to MySignals devices.

Download the Application and select the [Mac](#), [Windows](#), or [Linux](#) version, depending on what machine you have. Installation on each machine is straightforward:

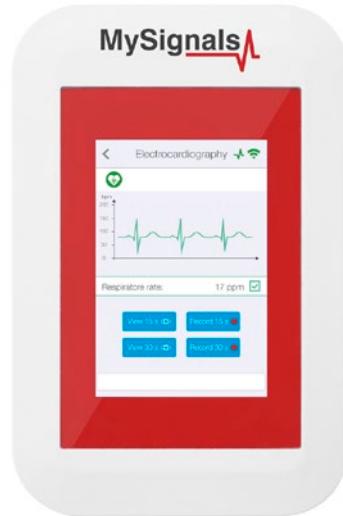
- On Windows, you'll have a .zip file. Double-click it, and drag the folder inside to a location on your hard disk. It could be Program Files or simply the desktop, but the important thing is for the processing folder to be pulled out of that .zip file. Then double-click MySignals\_Updater.exe to start.
- The Mac OS X version is also a .zip file. Double-click it and drag the Libelium Smart Devices App icon to the Applications folder. If you're using someone else's machine and can't modify the Applications folder, just drag the Application to the desktop. Then double-click the Libelium Smart Devices App icon to start.
- The Linux version is a .tar.gz file, which should be familiar to most Linux users. Download the file to your home directory, then open a terminal window, and type: tar xvfz MySignals\_Updater-xxxx.tgz

## 6. Data Access

MySignals SW includes three different modes to access all the information gathered from the sensors:

- Standalone Mode: MySignals does not send the data. It is just visualized on the TFT screen.
- Bluetooth Connection Mode: MySignals send the data to a mobile phone using the BLE connection. The data is gathered and visualized by the MySignals App. Then if the Cloud option is enable, the data will be also transferred to the user's account at the Libelium Cloud.
- Server Connection Mode: MySignals uses the WiFi connectivity to send the data directly to the Libelium Cloud.

In September 2017 we have released new Firmware, Apps and Cloud versions that allow to record continuous waves and send them to record continuous waves and send them to the Cloud (in Server Mode). You can record 15 or 30 seconds of the data measured in detail mode of **ECG, EMG, Snore** and **Airflow**.



## 6.1. MySignals Standalone Mode

This mode consists on displaying the information from the sensors directly on the MySignals screen without any other external device. All you need is to navigate through the menus on the screen following this instructions.

*MySignals includes a stick to navigate through the menu options of the touchscreen. Please use it for a correct function of the device interface.*



Figure: Touchscreen stick included

### 6.1.1. Using Standalone Mode

First of all power the device with the Libelium MySignals power supply.

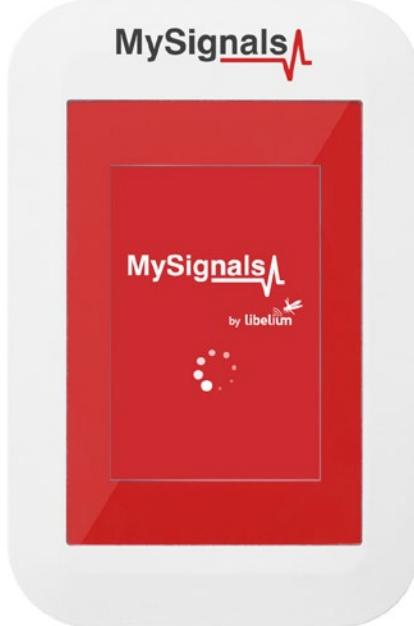


Figure: TFT intro image

To access this mode you must select standalone option in the setup menu: Offline mode, Bluetooth mode or Server mode. Click directly on "Start Monitoring" button.

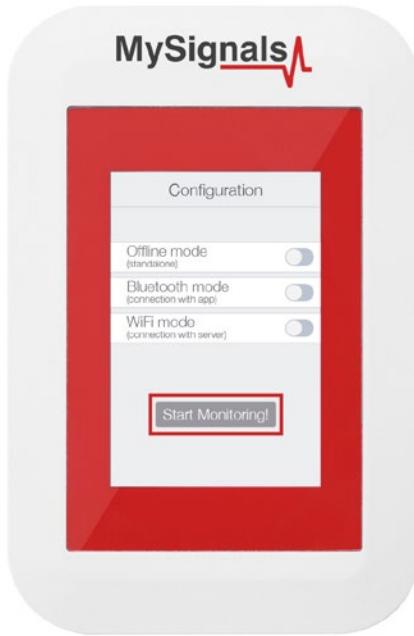


Figure: TFT mode configuration

Then you will enter in "Select Sensors" screen where you must select all the sensors that you want to measure. Selected sensors are in blue color and unselected sensors are in gray color.

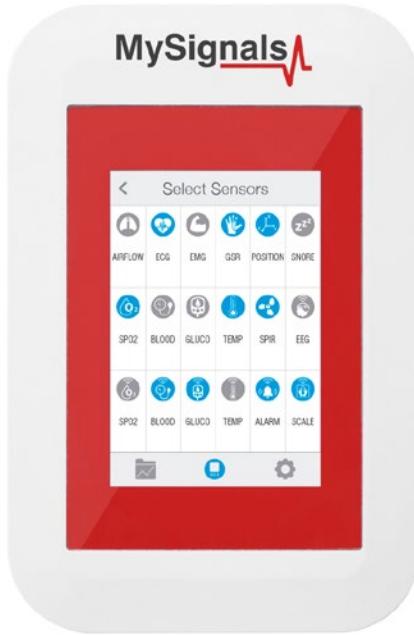


Figure: TFT Select Sensor

Once you have completed your selection you must click on "Data" button, which you can find at the left end of the bottom toolbar.

In "Data" screen you will be able to see in one glance the main information of all sensors at once. The selected sensors will be green and sensors are not selected in orange.

You can see in this screen a color code in the sensor logos:

-  Green: The sensor is selected.
-  Orange: The sensor is not selected.

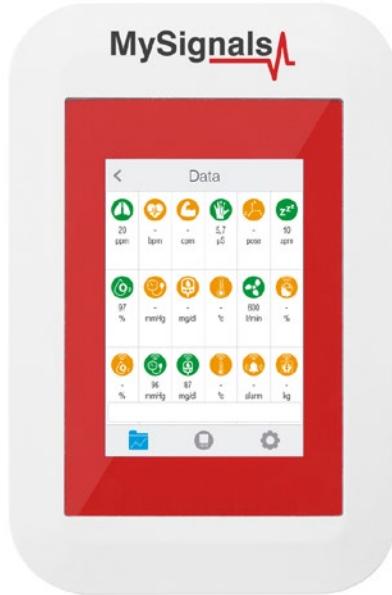


Figure: TFT data

If you are interested in viewing all the information in one particular sensor simply you have to click on it to enter a detail sensor view. On this screen you can see a graph of one of the sensor values and all the detailed information on a list view.



Figure: TFT detail view

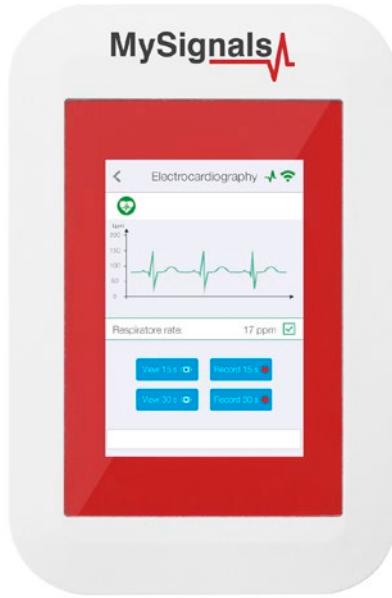
In detail mode of glucometer sensor, you can use the DELETE button in order to delete the Spirometers measures stored in the sensor (it should be connected when you press it).

In detail mode of blood pressure sensor and blood pressure BLE sensor, you can use the measure interval of time in order to configure the time between each measure. '0' indicates that MySignals powers off the sensor after each measurement.



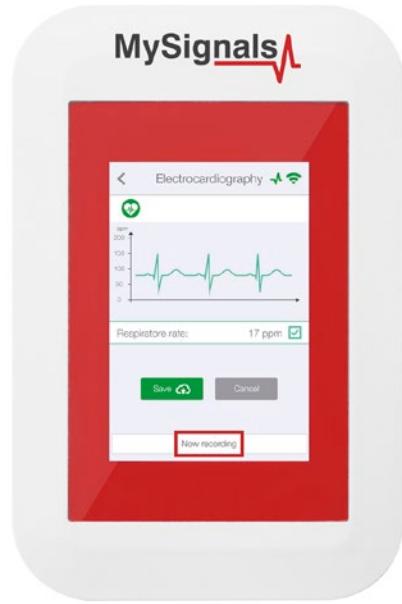
Figure: Blood pressure sensors detail view

In September 2017 we have released new Firmware, Apps and Cloud versions that allow to record continuous waves and send them to record continuous waves and send them to the Cloud (in Server Mode). You can record 15 or 30 seconds of the data measured in detail mode of **ECG**, **EMG**, **Snore** and **Airflow**.



You can use this new function in Server Mode using detail mode. Use the **Record 15 seconds** or **Record 30 seconds** buttons in order to start a new record.

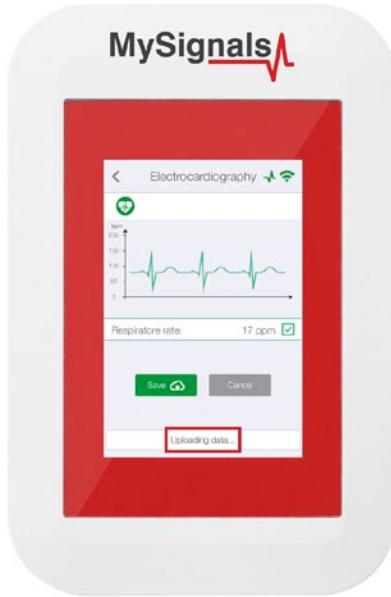
Note that you must use **View 15 seconds** or **View 30 seconds** buttons each time you want to see the wave in the screen.



With the record finished you can choose between saving this record in the cloud or cancel it.



You will see all the information about the upload to the cloud at the bottom of the screen (text message zone).



After a correct upload you will see the date of the file saved. Then you can see this new raw data file in the Web Server or in the Mobile App.



At any time you can navigate back to return to the previous screen by clicking the arrow on the top left of the screen.

There is available a extra configuration section in the TFT where you can see your configuration info active: WiFi, account, user...

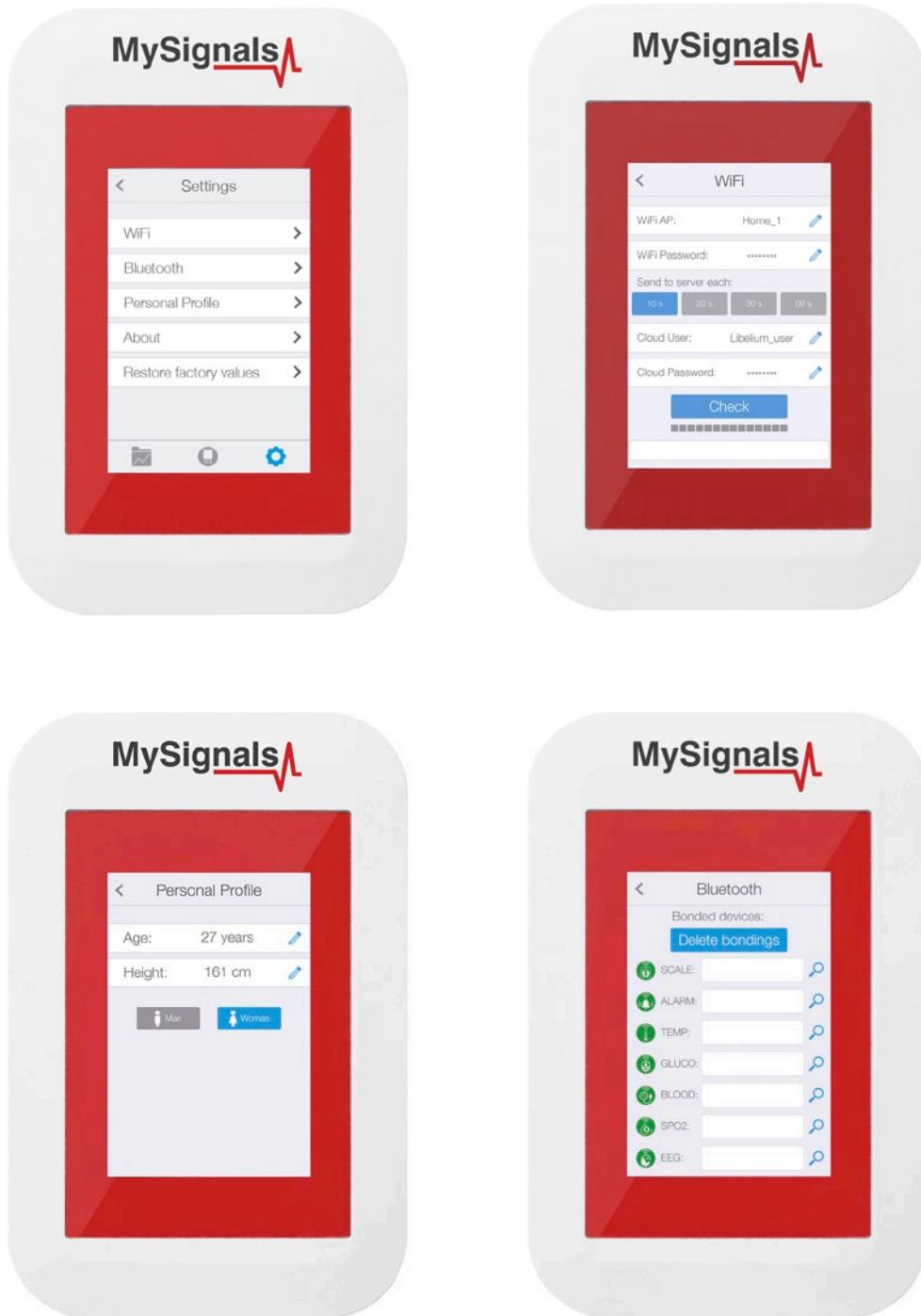


Figure: TFT settings and others

You can introduce your WiFi AP and your WiFi password in order to save this information to MySignals.

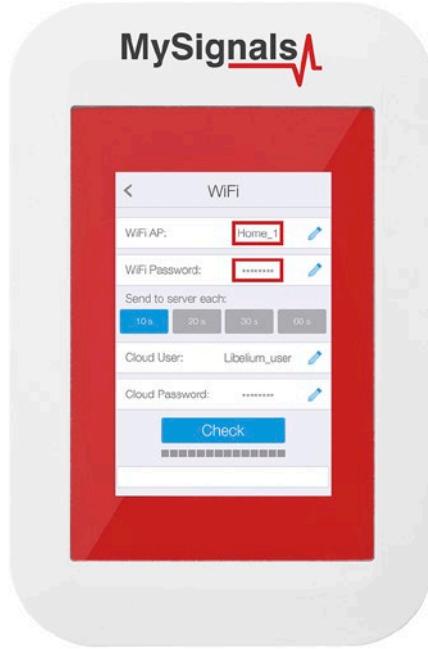


Figure: WiFi settings

In addition to this, you must also enter your Cloud User and Cloud Password if you want to use Server Mode.



In the same section you can use the CHECK button in order to test the WiFi connection and your Cloud User credentials. MySignals will show you the results of the connection test.

You can change the interval that configure MySignals to send data to the server. Introduce the value in seconds. MySignals will send data to the server as it is configured.

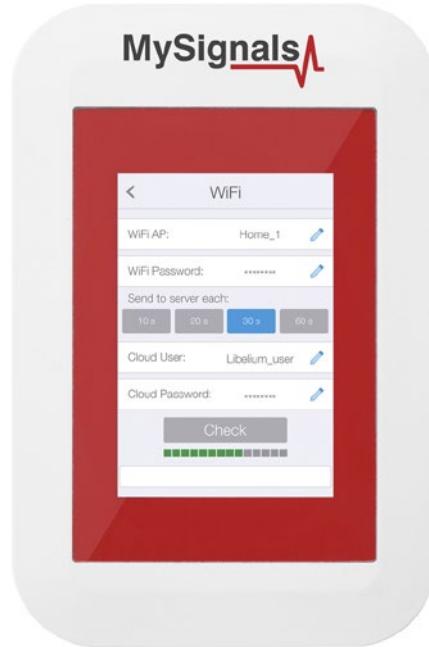


Figure: WiFi settings

In BLE configuration section you can search other devices MACs of the BLE sensor that you want to monitor with MySignals using the magnifying glass. Each sensor include their own MAC information.

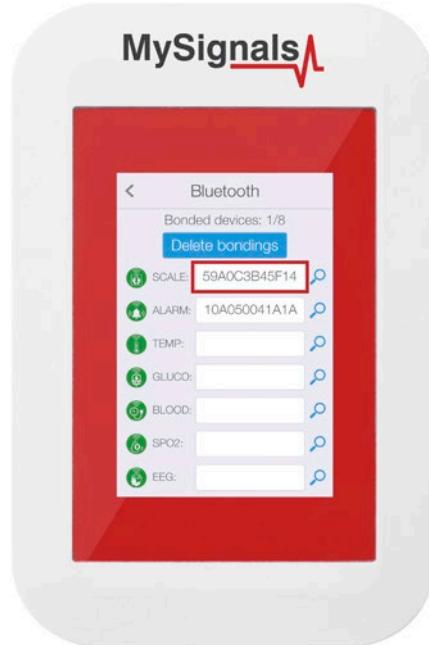


Figure: Bluetooth settings

You can use the DELETE BONDINGS function in order to delete all the Bluetooth connection information.

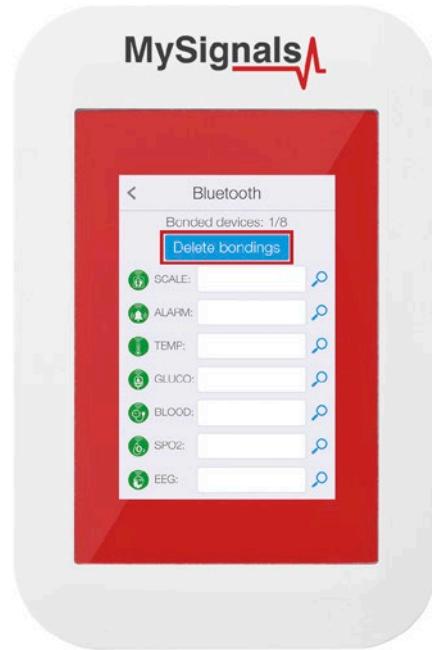
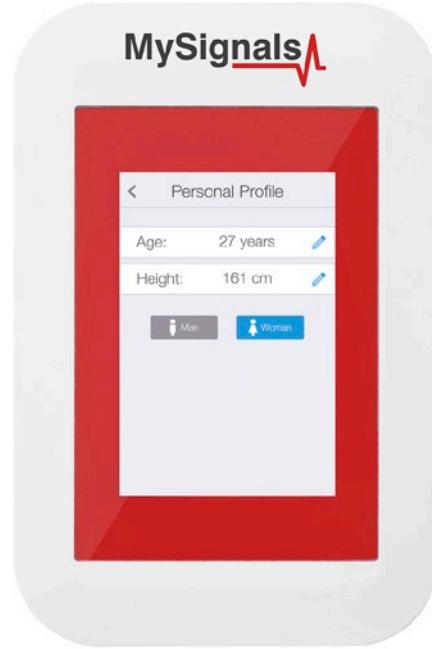


Figure: Delete Bondings Function

In Personal Profile section you can introduce your data: age, height and gender.



You can use the RESET FACTORY VALUES function to restore MySignals to the basic configuration.



**NOTE:** The Firmware of MySignals SW manages all the sensors at the same time and monitors the response of the screen and the touchscreen. For this reason sometimes during the measurement of different sensor like blood pressure or other wireless sensors it will be able to perform one action at the same time, you have to wait it to finish before being able to navigate or interact with the screen again.



Figure: Detail mode Web Server

- Red color indicate that you can not use the touchscreen in this moment. So try to keep the zone pressed until you receive a visual response on the TFT.
- Green color indicate that you can use the touchscreen as usual.

There is available too in the bottom of the screen a black zone where MySignals will write text indications about the actual state of the device.

## 6.2. MySignals Mobile App

The Bluetooth connectivity may perform direct communications with iPhone and Android devices without the need of an intermediate router.

First of all you must download MySignals App in your store. The App is available for Android and iPhone.

### Troubleshooting:

Sometimes you will need to configure the connection with MySignals using the Android or iOS settings.

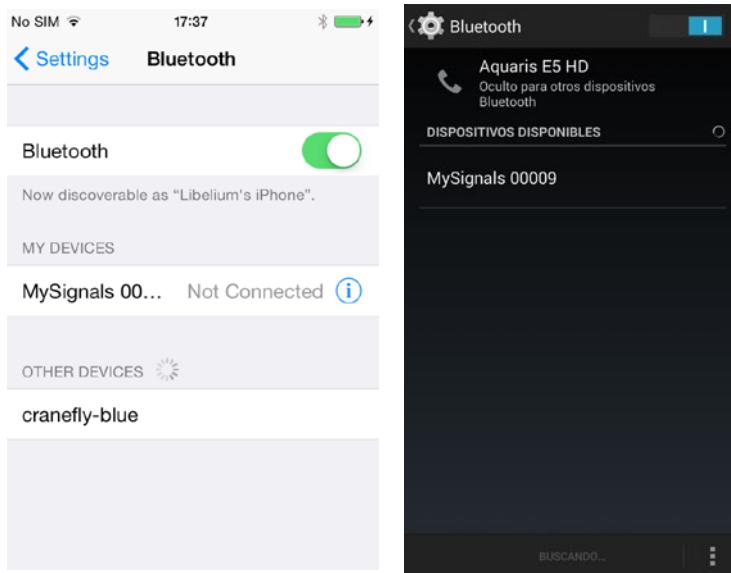


Figure: Settings BLE configuration

Here you can find a solution for all possible known issues the user can face on MySignals Applications (iPhone/iPad and Android).

#### • **Android:**

- Do not start the mobile Application until MySignals device is in Bluetooth mode. The mobile Application needs Bluetooth communication to read data from MySignals device.
- Sometimes the Bluetooth stack becomes corrupted due to use of other Bluetooth Applications, when this situation happens, the Applications sometimes does not connect to MySignals device, to solve this issue switch off and switch on Bluetooth device on device settings.
- In some android devices, when the user switch off and on the Bluetooth radio, the mobile device loses all bonded devices, at this point the user must delete the bonding connections on MySignals device.
- On Android devices the pop-up dialog to introduce the passkey does not show on screen, this is due to Bluetooth stack is malfunctioning, the solution is to switch off and on the Bluetooth radio on device settings.
- When the user deletes bonded connections on MySignals device and mobile device the MySignals device does not show PIN passkey to create a new bonding connection, at this point the user should exit and enter again from Bluetooth mode on MySignals device.
- On Android devices, the user can create a new bonded connection using Bluetooth section in mobile device. To perform this action go to Settings Application → Bluetooth and touch the listed device to start a new bonding action.
- It is not possible to delete bonded devices in MySignals mobile Application, to delete a bonded device go to settings Application from your Android device and select Bluetooth section, there you can get the list of bonded devices, you can delete the desired Application on that point.
- If the user deletes a bonded device in Android device then the bonded connection must be deleted on MySignals device too.
- As general rule, the Bluetooth stack has different implementation on Android devices, it depends the

hardware manufacturer, so when the Bluetooth stack fails most of issues can be solved by switching off and on the Bluetooth radio on settings Application on Android devices.

- When the user select a single sensor mobile Application communicates with MySignals device, the communication time can last a couple of seconds. The user must wait until the new values arrives.
- Connection time with MySignals can last until one minute, Bluetooth connection and communication time depends n each manufacturer, some of them are faster and some of them are slower. Wait until the connection between mobile Application and MySignals device finishes.
- If sensor notifications does not arrive there could be a bonding problem or MySignals device is stuck, check that MySignals device can exit from Bluetooth mode to check the MySignals state also exit from mobile Application and kill it from background to start a new Bluetooth connection between the mobile Application and MySignals device.

#### • iPhone/iPad:

- Do not start the mobile Application until MySignals device is in Bluetooth mode. The mobile Application needs Bluetooth communication to read data from MySignals device.
- Sometimes the Bluetooth stack becomes corrupted due to use of other Bluetooth Applications, when this situation happens, the Applications sometimes does not connect to MySignals device, to solve this issue switch off and switch on Bluetooth device on device settings.
- It is not possible to delete bonded devices in MySignals mobile Application, to delete a bonded device go to settings Application from your iOS device and select Bluetooth section, there you can get the list of bonded devices, you can delete the desired Application on that point.
- If the user deletes a bonded device in iOS device then the bonded connection must be deleted on MySignals device too.
- As general rule, when the Bluetooth stack fails most of issues can be solved by switching off and on the Bluetooth radio on settings Application on iOS devices.
- When the user select a single sensor mobile Application communicates with MySignals device, the communication time can last a couple of seconds. The user must wait until the new values arrives.
- Connection time with MySignals can last until one minute. Wait until the connection between mobile Application and MySignals device finishes.
- If sensor notifications does not arrive there could be a bonding problem or MySignals device is stuck, check that MySignals device can exit from Bluetooth mode to check the MySignals state also exit from mobile Application and kill it from background to start a new Bluetooth connection between the mobile Application and MySignals device.

MySignals mobile Applications was tested on these devices:

Brand	Model	OS version	Memory	Kernel
BQ	Edison 3	4.4.2	2 GB	v3.4.67
Apple	iPad 2	8.4.1	512 MB	v5.4.00
Apple	iPhone 4S	8.3	512 MB	v5.4.00
LG	G2	5.0.2	2 GB	v3.4.0
Moto	G2	6	1 GB	v3.4.42
Nexus	10	5.1.1	2 GB	v3.4.67
Nexus	4	5.1.1	2 GB	v3.4.0
BQ	Aquaris E5 HD	4.4.2	2 GB	v3.4.67
Huawei	T1 7.0	4.4.2	1 GB	v3.10.17

## 6.2.1. Using Bluetooth Connection Mode

Below and to avoid any connection problems we recommend restarting the Bluetooth on your device if you already had it previously activated. We recommend doing this every time you open the App again. In order to do this go to Settings in your device, then Bluetooth and turn it off and on.

The first time a user starts MySignals Application, it will be needed a setup assistant to configure all aspects related to MySignals configuration like user name, password (already set in our back end), profile, WiFi settings and MySignals selection. We will create a setup assistant with straightforward screens with all field and information to guide the user through this assistant.

*In order to make the MySignals App send to the Cloud you need:*

- *Have one Department created.*
- *Have one user created and linked to one Department.*
- *In the Mobile App on members section, tap on desired member and on his/her detail press "Select this user". Make sure that you selected a member in order to send the data, all measures must be linked to a valid user, this process also helps to register the MySignals device in the cloud.*
- *Make sure the "Cloud" icon is active (upper right corner of the App).*

The first time you open the App you will see some configuration screens:

- For information on how to create an account and activate your license please visit the point 5.2.1 of this guide.
- An account can have one or more MySignals devices, this is why an user can purchase more than one device. Then we must create a MySignals Manager profile to provide a list of devices and perform some basic operation on them.
- This Manager Profile can add/delete/modify/select an MySignals device. This information should be synchronized with cloud to get all devices up to date for a given account.
- As each MySignals is tied to each single user, we should download a list of devices each time an user log in , this way we do not mix MySignals from different accounts.

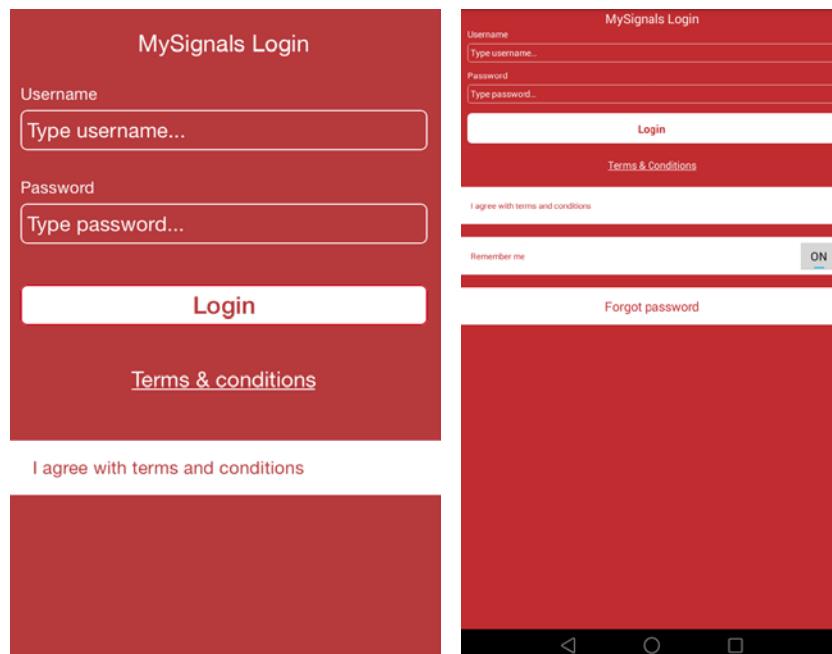


Figure: App login

It is very important that you read carefully and accept the Terms and Conditions of our Application.

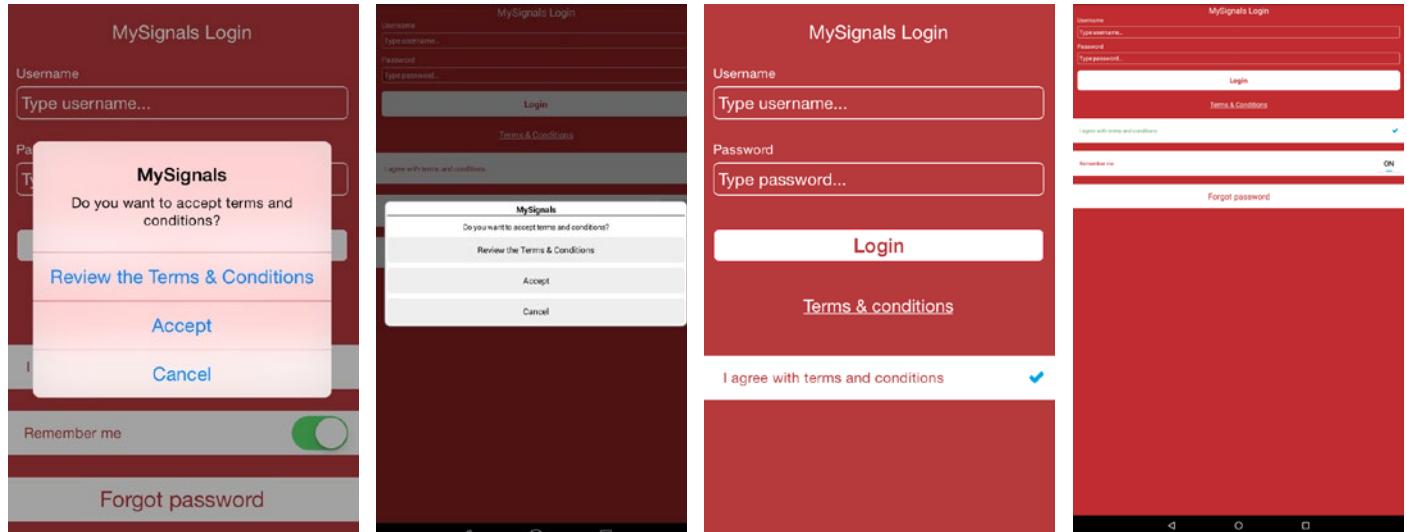
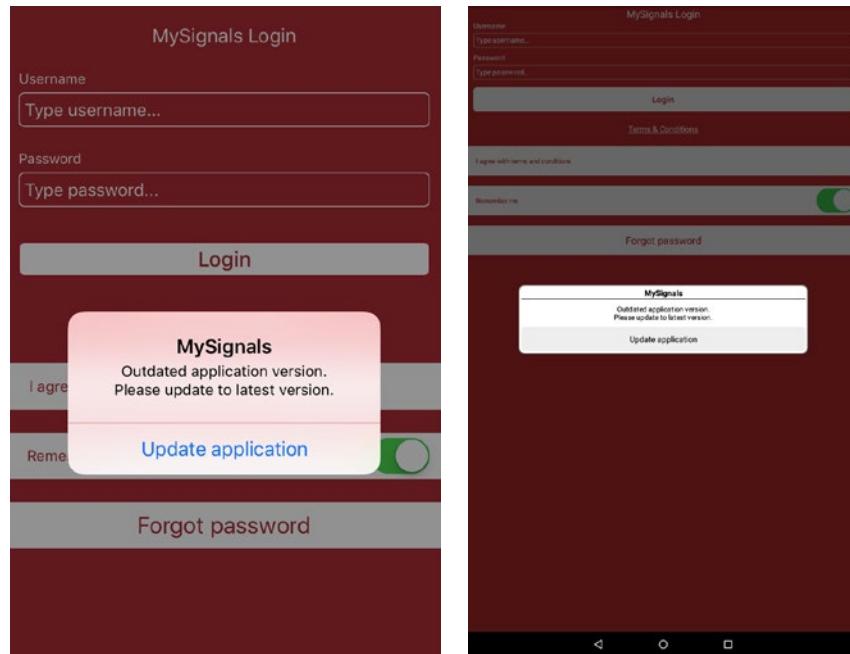


Figure: T&C section

The mobile application adds a new feature to warn the user when a new update is available. On the login screens will show a popup window with that takes the user to the stores to perform the update, the warning will show on each new release and it will be mandatory to update the mobile application to keep on using it.



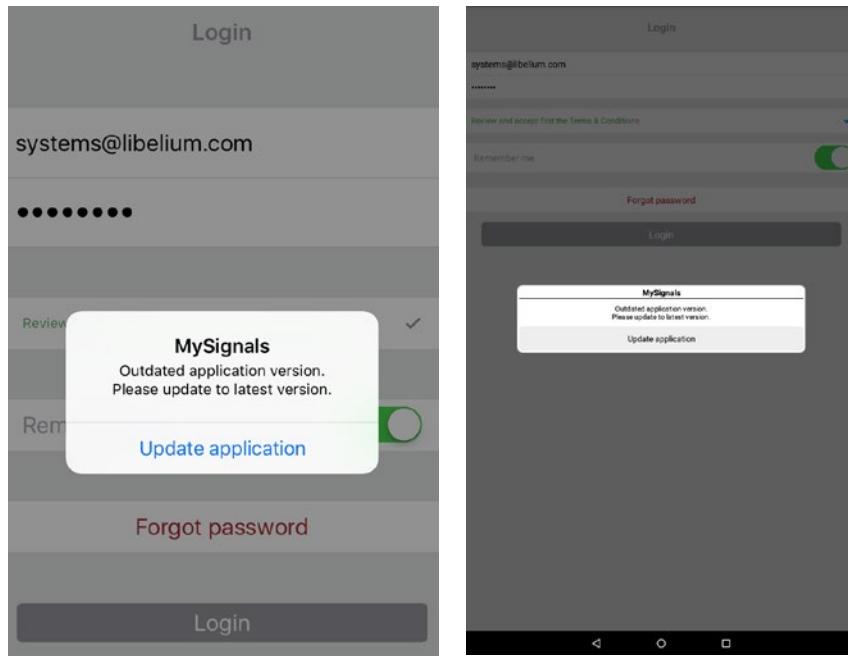
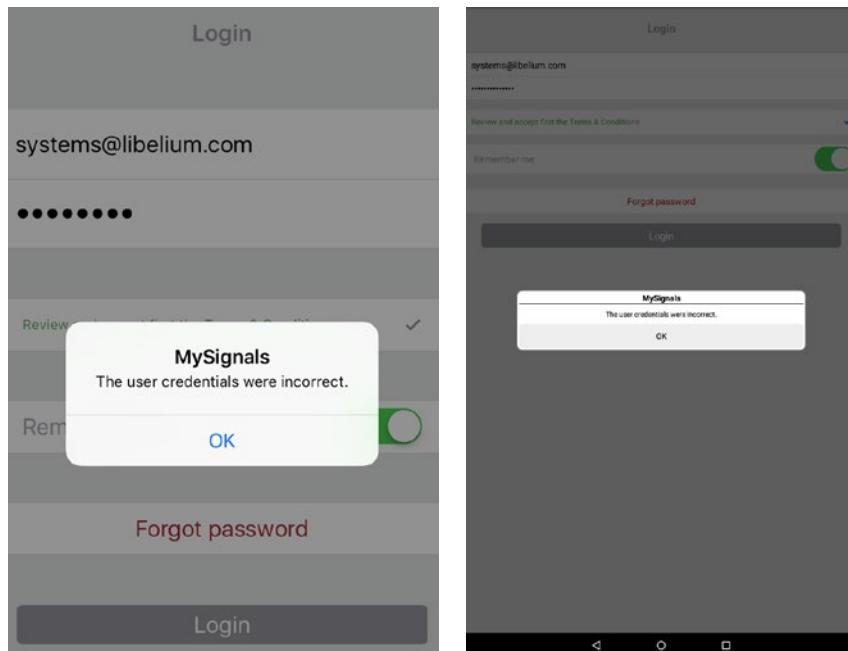


Figure: Update mobile application message

There is also a new feature on the login screens, now the user can get messages to advice about the quota of his account or incorrect password among other messages. The feature can warn about many erratical situations, these are the common ones:

- Incorrect account password.
- Expired license.
- Application limit request reached.
- Application over maintenance.
- Other errors.



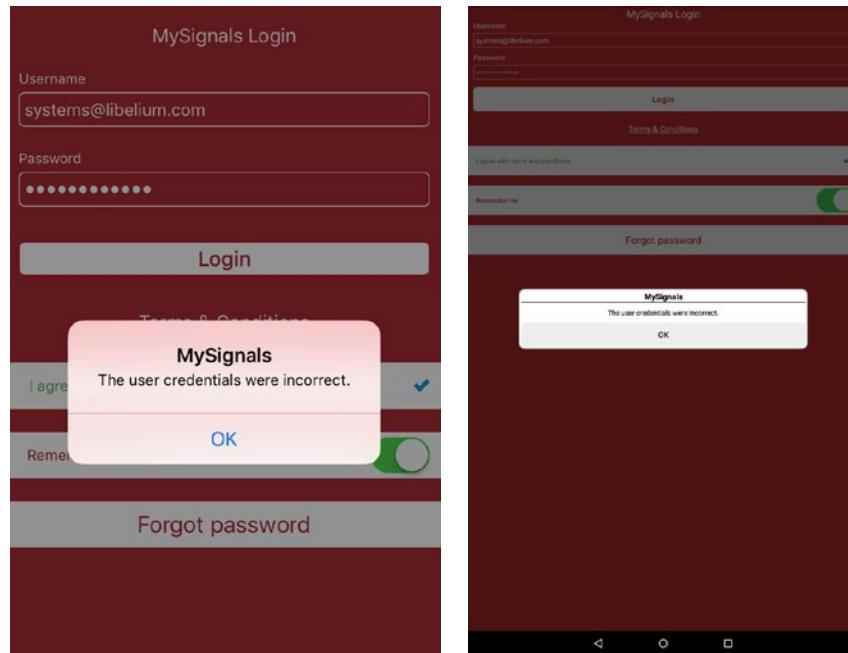


Figure: Error messages over mobile application

- Now we move to the next screen "Profile" and enter our Manager Profile personal info.

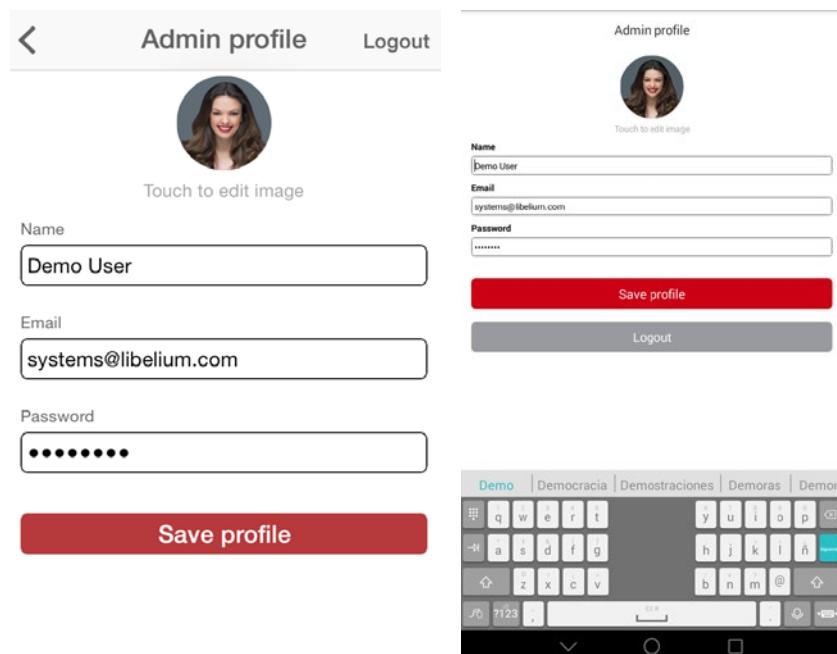


Figure: App profile

- Once arrived to the last configuration screen, before doing anything here in the phone App, you must power on MySignals, select “Bluetooth Connection” on configuration screen and click “Start Monitoring” button.

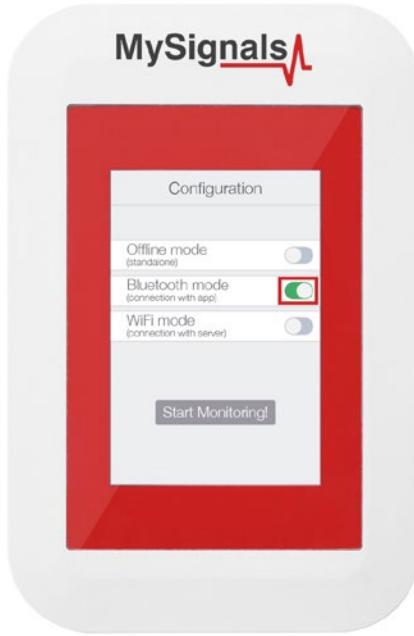


Figure: TFT BLE selected

When you see “Not Connected” message on the screen and a gray Bluetooth icon on MySignals screen, you can click on “Search for MySignals” in your phone App.

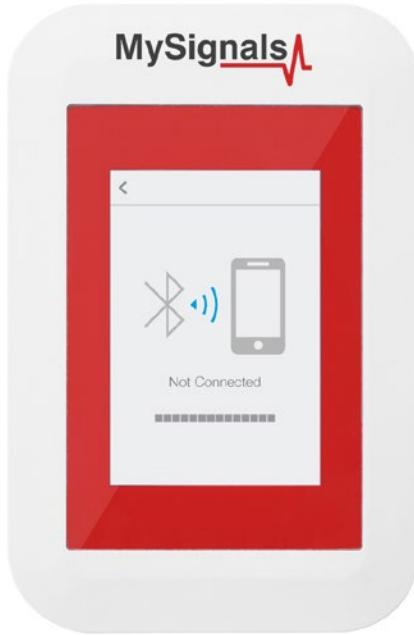


Figure: TFT BLE not connected

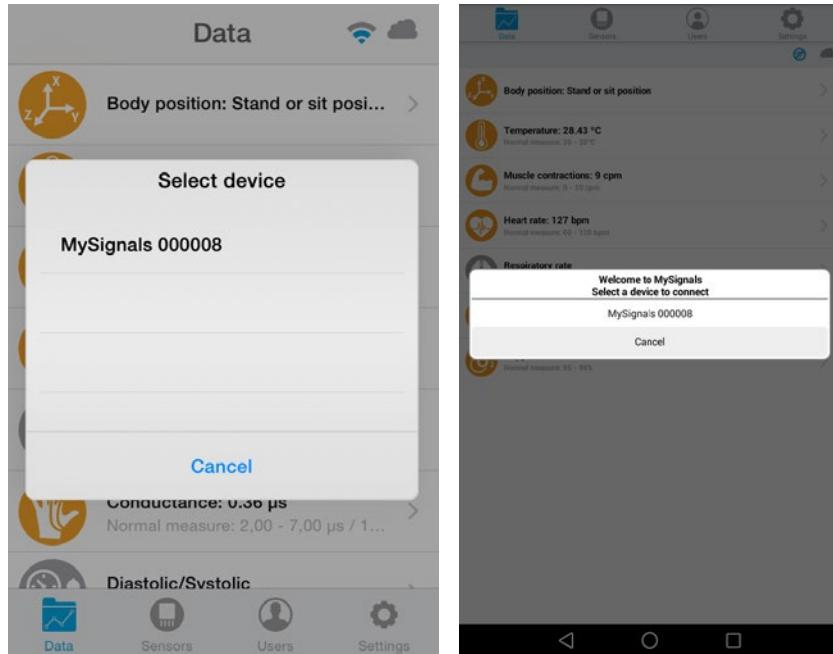


Figure: App searching

Select your MySignals device on the list. Now if the Bluetooth connection is working well, you will have to enter in your phone the code that you will see in blue color figures in MySignals screen. If you are using Android please check your notification center if your phone doesn't ask you to enter the code automatically.

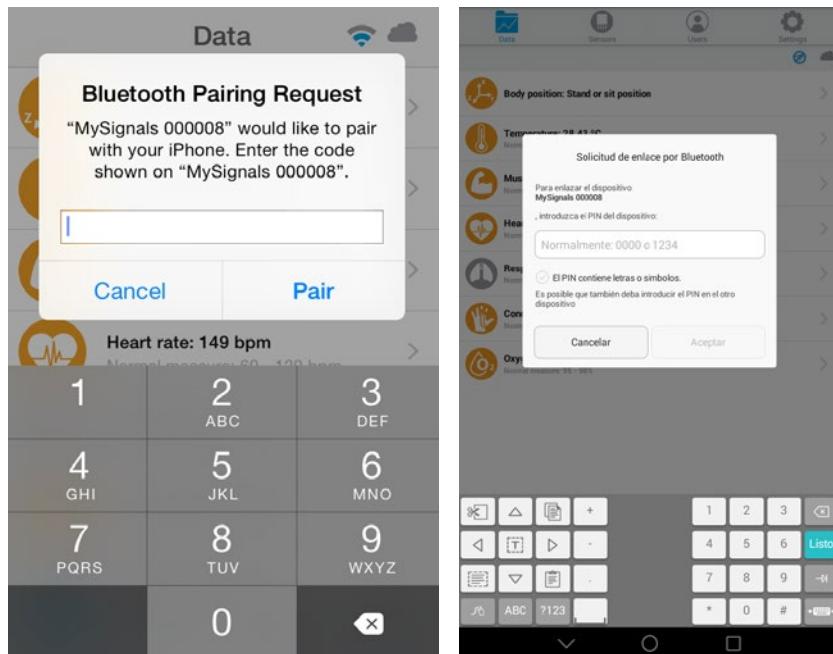


Figure: App device list



Figure: Bluetooth PIN

- The next screen is "Sensors", where you must select all the sensors that you want to measure. Selected sensors are in blue color and unselected sensors are in gray color.

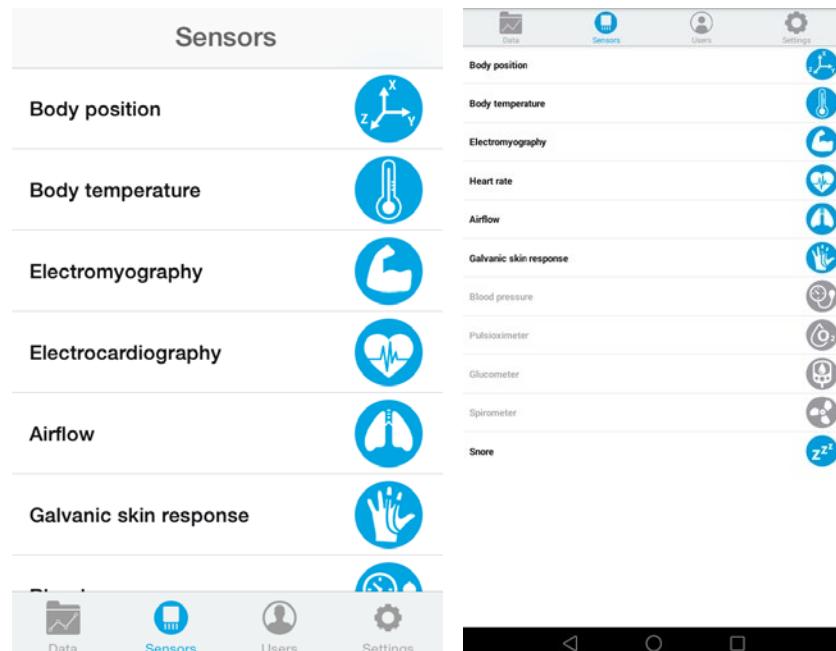


Figure: App sensor selection

MySignals device will send data to Application using two modes:

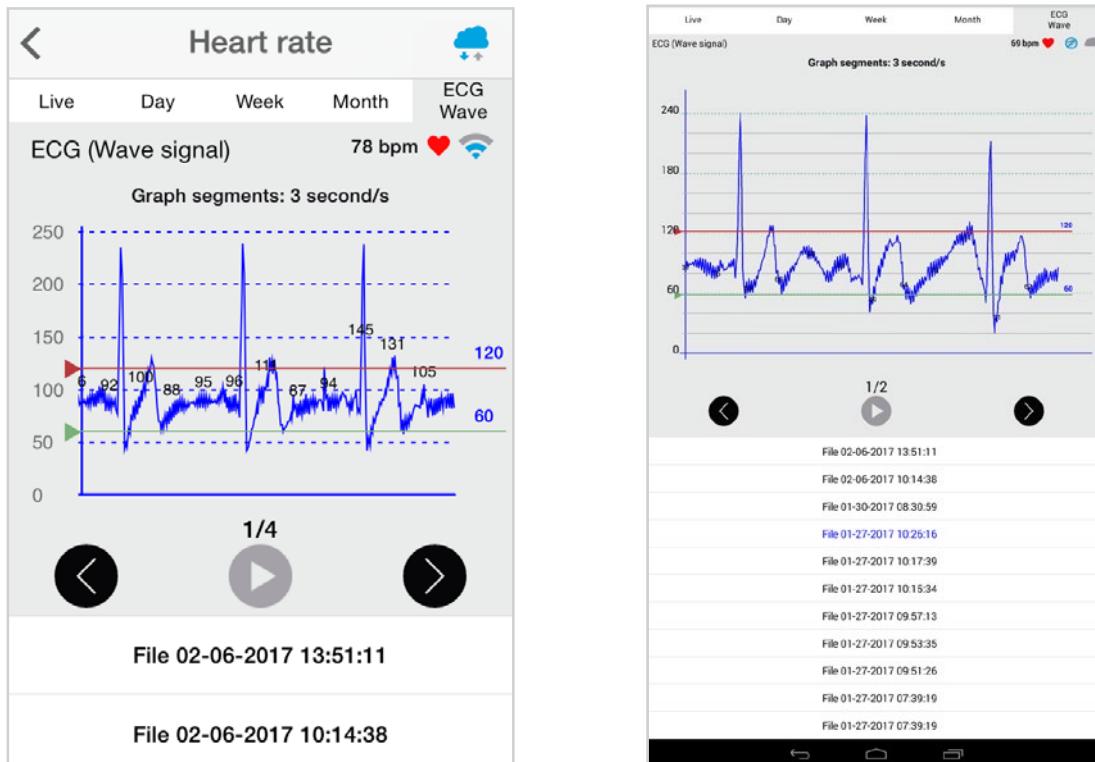
- In **General mode** the MySignals device will send all values for all sensors, this is used for main sensors screen where we show a list of selected sensors by the user with its values.

You can see in this screen a color code in the sensor logos:

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previously connection of some time ago.
- Grey: It is that the sensor is not connected.
- Regarding to **Detail mode**, it is used when the Application shows a detailed view from sensor, MySignals will only send data for this single selected sensor. The Application will send a sign to MySignals to switch on and off this mode.

There is a new tab on detail screen for ECG, EMG, Airflow and Snore sensors. This tab allows the user to display raw data recorded from MySignals device (in Server Mode). You can record until 30 seconds from MySignals device and show the recorded data on raw data tab, this tab is placed on the top right of the screen.

On top right, you can see the ECG rate, EMG rate, Airflow rate or Snore rate. Above the graph, you can see the graph time for X axis, in this case the graph was divided in windows of parts of 3 seconds each.



Over the graph you can notice the values for each important data peak, you can track wave changes by watching these values.

You can move the limits of the graph with the green and red lines, touch each line to move it along the graph view.

On bottom section from the graph view there are three buttons:



Right and left arrow buttons let you move the graph to right or left. In the middle position, there is a play/pause button to start or stop the carousel mode. By default and once the graph load ends, the graph animation plays automatically. For instance, if you record 30 seconds on MySignals device, the Application will show 11 parts to navigate using the left/right arrow buttons. Once the graph ends loading, the animation will play automatically.

Just above the play/pause button, you can see a little navigation legend to know which part of the full graph you are showing.

At the end of the screen you can get the list of MySignals recordings provided by the user from the device, this listing is shown in order from latest to oldest one, each row shows the recording date and time. Tap on one row to select a single recording and the mobile Application will start plotting the data on the graph, the row will be also highlighted to let the user know which row is currently plotting.

The listing rows have a sampling rate and it is about 10 milliseconds.

When the MySignals device establish a pairing with the Application it send information in Datagram mode by default.

Once you have completed your selection you must click on "Data" button, which you can find at the left end of the bottom toolbar.

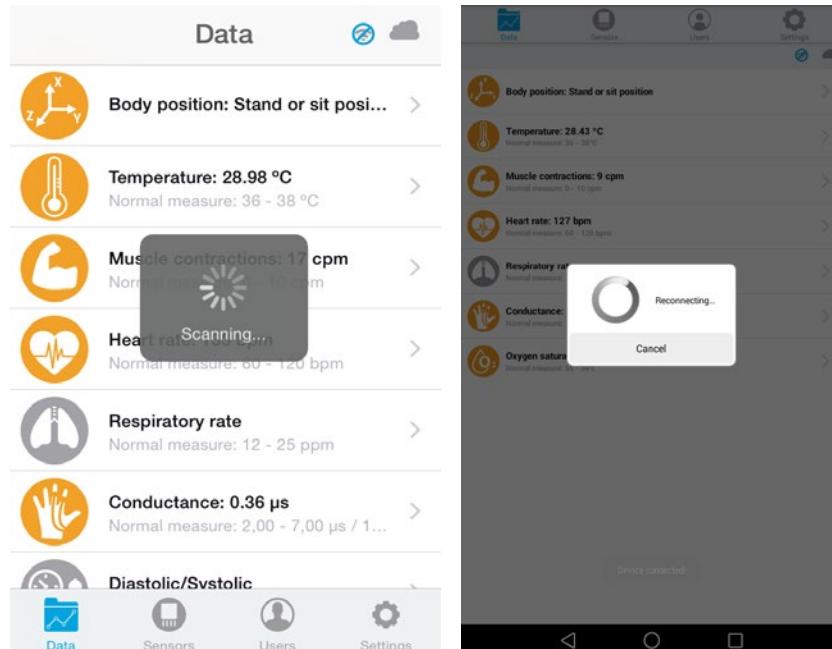


Figure: Connecting

In "General mode" screen you will be able to see in one glance the main information of all sensors at once. The latest received sensor info will be green, the sensors with old received info will be orange and sensors that hasn't received info will be gray.

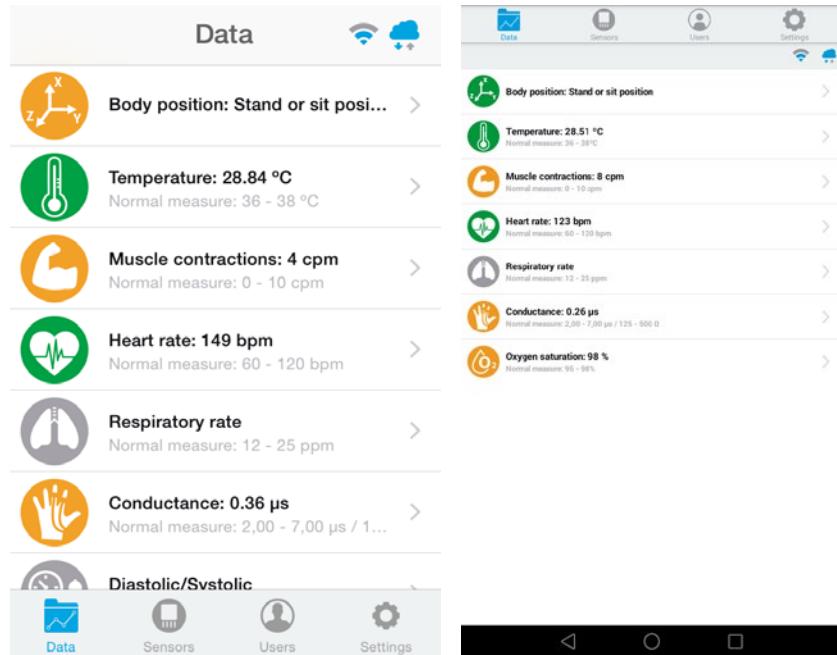


Figure: App general mode

**IMPORTANT:** In the detailed view only information coming from that specific sensor is received and send to the Cloud. If you want to receive and store information coming from many sensors at the same time you should use the "General view" screen.

**NOTE:** At any time you can Activate / Deactivate the synchronization of the information being sent to your Cloud Account by just pressing the Cloud icon on the top right corner.

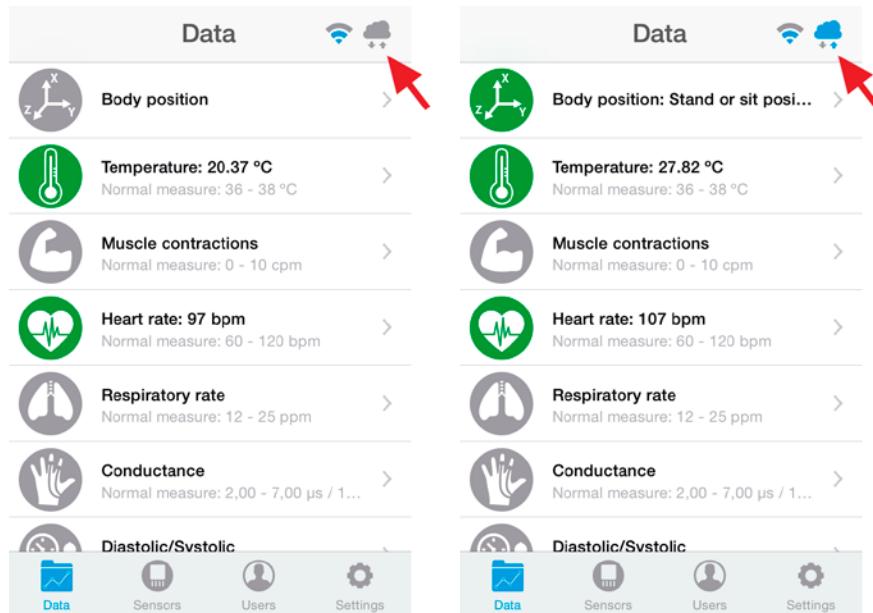


Figure: Cloud synchronization button

Using the users section you are able to select and modify the user profile.

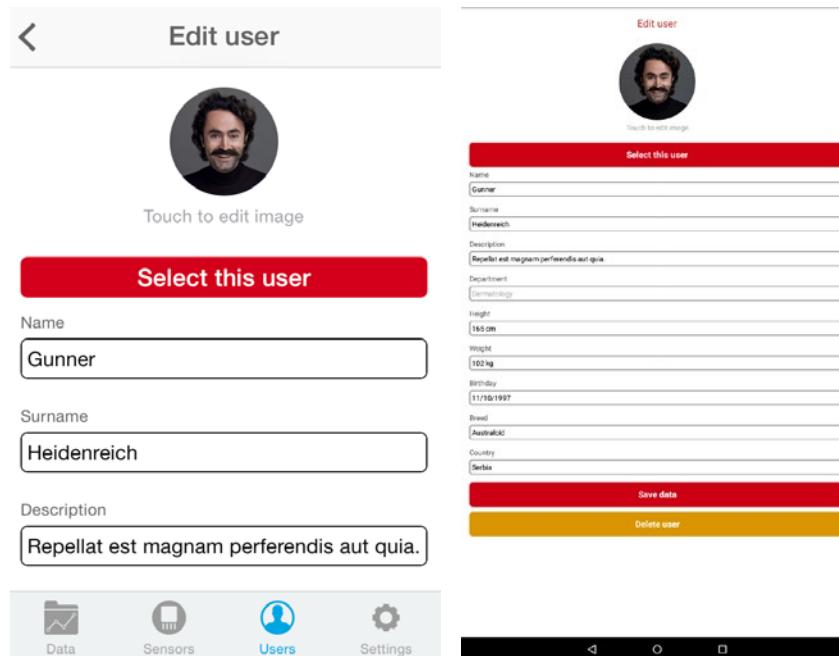


Figure: App user configuration

Or organize them in different departments.

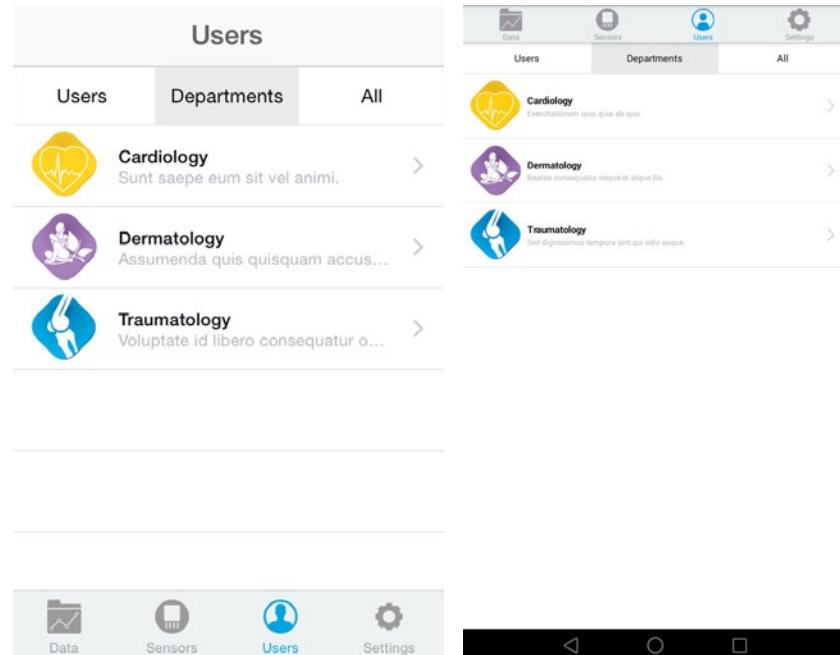


Figure: App department sections

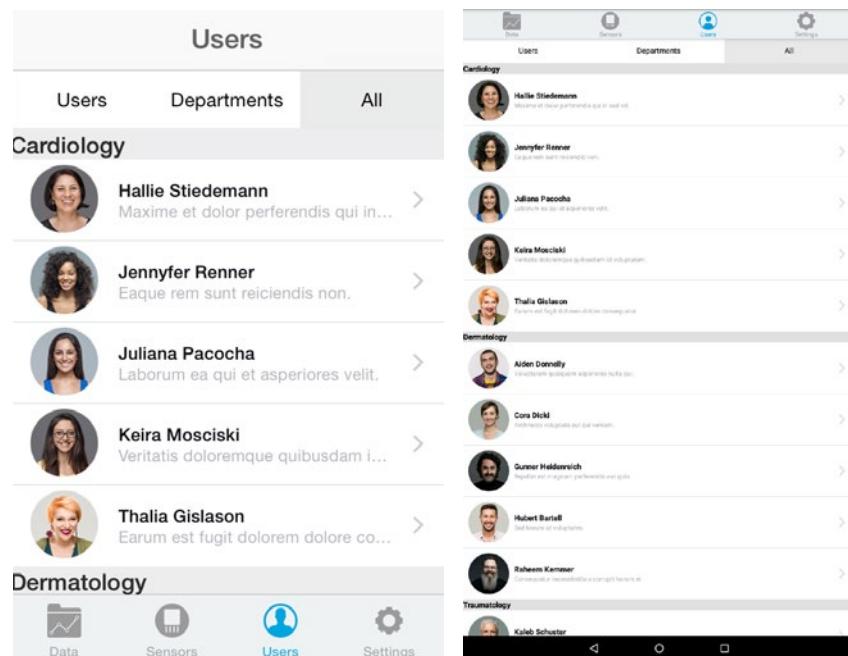


Figure: App department organization

There are several basic configuration screens: language, profile, user.... Where you can change your basic configuration.

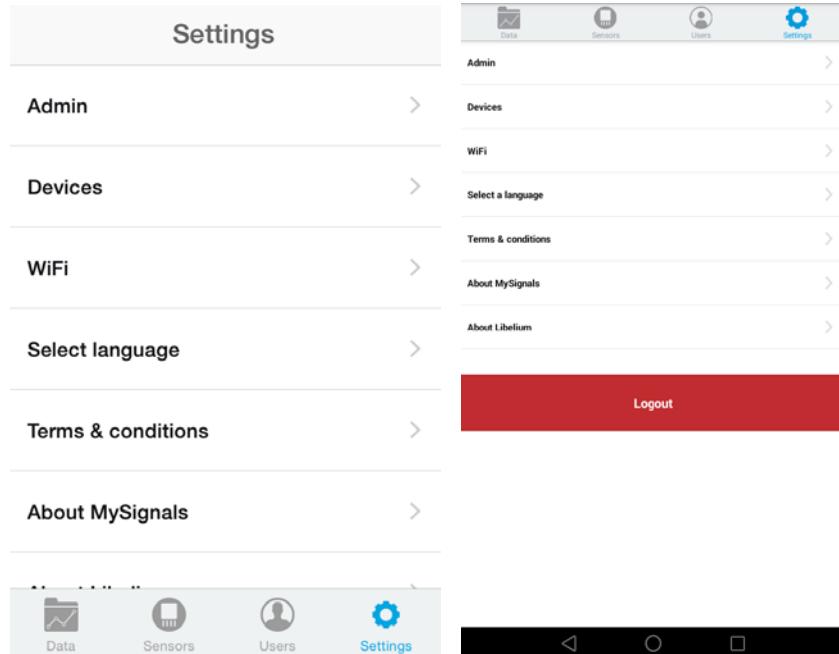


Figure: App settings mode

- You can logout and login with another MySignals account:

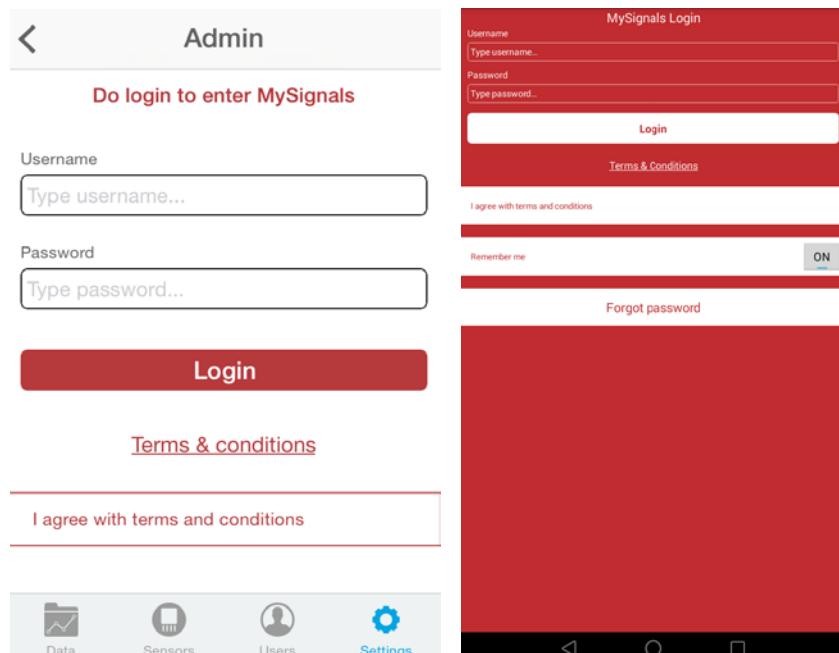


Figure: App settings login

- You can change the language of the Application:

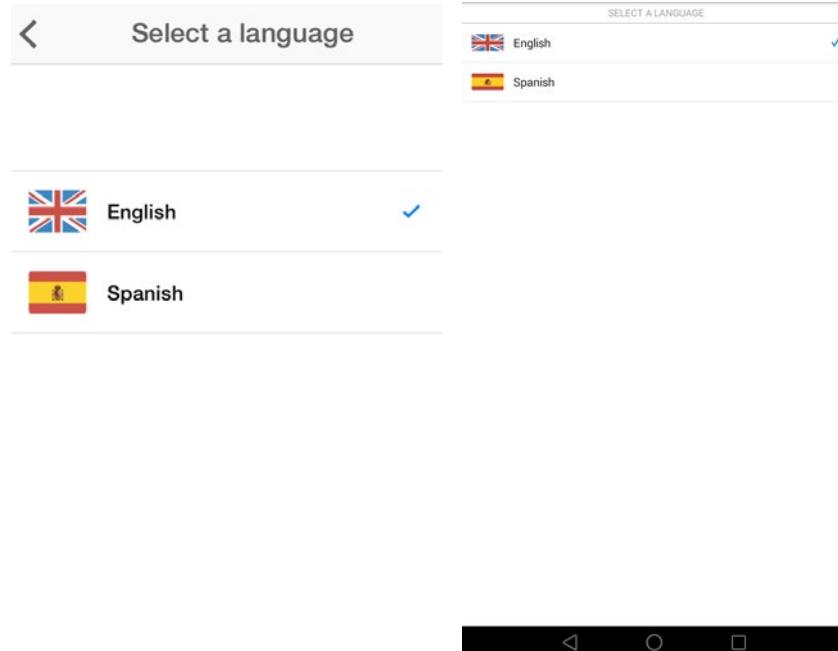


Figure: App settings language

- You can change the device MySignals connected to the App.

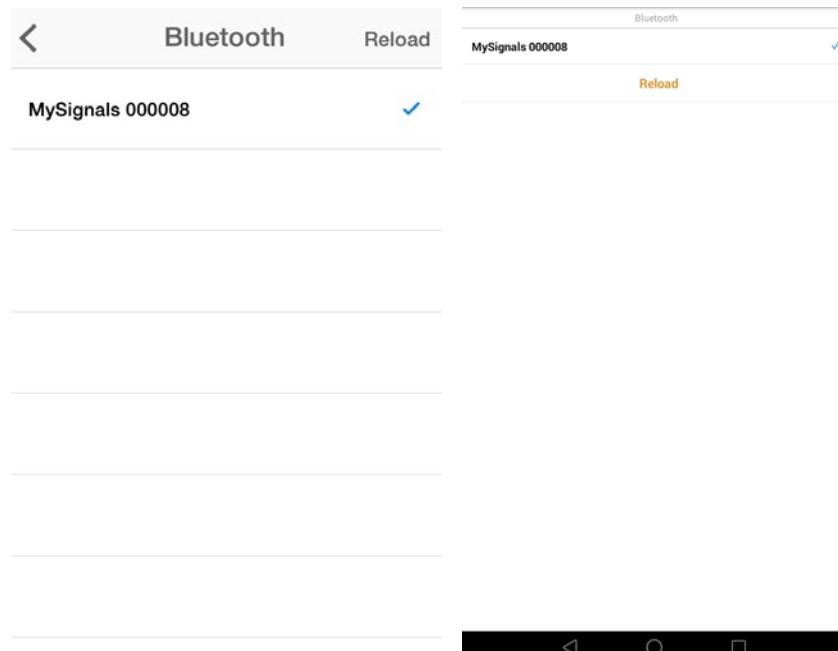


Figure: App settings devices

Also you can select the sending data rate for the cloud, this way you choose the amount of data you want to display and store in libelium's data cloud, just tap on the time option on the list (provided in seconds) to select the time rate:

Settings	
Admin	>
Devices	>
WiFi	>
<b>Data sending rate to server</b>	
<b>Select language</b>	
<b>Terms &amp; Conditions</b>	

<span style="font-size: 1.5em;">...</span>	 Data	 Sensors	 Members	
		 Settings		

Admin	>
Devices	>
WiFi	>
<b>Data sending rate to server</b>	
<b>Select language</b>	
<b>Terms &amp; Conditions</b>	
<b>Updates</b>	
<b>About MySignals</b>	
<b>About Libelium</b>	

[Logout](#)

Data sending rate to server

10 seconds

20 seconds

30 seconds

60 seconds



-61-

v4.6

## 6.2.2. Installing to an iPhone

**Installation:**

a) Download the Application from App Store:

- Then double click on the icon, or right click and open with iTunes.
- Inside iTunes, on the left panel, click on DEVICES->Your Device.
- Select on the top “Apps”, and select Sync Apps. Drag into the desired screen e-Health App.

Once installed, the App Appears in your iPhone/iPod screen.

The App shows the information the nodes are sending which contains the sensor data gathered.

## 6.2.3. Installing to an Android

**Installation:**

a) Download the Application from Android Market:

Once installed, the App Appears in your device screen.

The App shows the information the nodes are sending which contains the sensor data gathered.

## 6.3. MySignals Cloud

The data sent via WiFi o BLE through the App can be visualized on MySignals website.

Navigate through the history of previously stored data or even create many users in order to save the biometric information linked to a specific profile.

MySignals allows to share data with the cloud, and perform real-time analysis.

### How do I ensure the privacy of the biometric data sent?

Privacy is one of the key points in this kind of Applications. For this reason the platform includes several security levels:

- In the communication link layer: WPA2 for Wifi and AES256 encryption.
- In the BLE communication: Bonded and encrypted connection.
- In the Application layer: by using the HTTPS (secure) protocol we ensure a point to point security tunnel between each sensor node and the web server (this is the same method used in bank transfers).

**NOTE:** The Firmware of MySignals SW manages all the sensors at the same time and monitors the response of the screen and the touchscreen. For this reason sometimes during the measurement of different sensor like blood pressure or other wireless sensors it will be able to perform one action at the same time, you have to wait it to finish before being able to navigate or interact with the screen again.



Figure: Detail mode Web Server

- Red color indicate that you can not use the touchscreen in this moment. So try to keep the zone pressed until you receive a visual response on the tft.
- Green color indicate that you can use the touchscreen as usual.

There is available too in the bottom of the screen a black zone where MySignals will write text indications about the actual state of the device.

### 6.3.1. Using Server Connection Mode (WiFi mode)

If you are interested in using this mode you first need to introduce your WiFi AP, WiFi Password, Cloud User and Cloud Password in WiFi Settings.

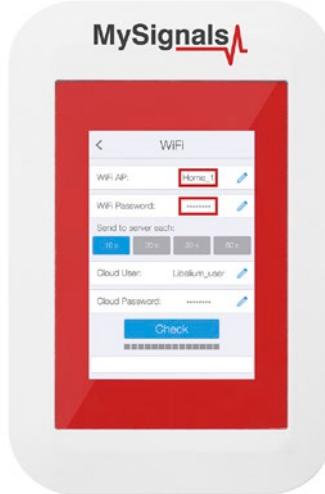


Figure: WiFi settings

You can use the Check button in order to test the WiFi connections and your Cloud User credentials.

Once completed this, you can return to the Configuration screen in MySignals and select WiFi mode and click "Start Monitoring".



Figure: TFT WiFi configuration

If all the info entered in the last point is correct you will see a WiFi connection screen and automatically it will direct you to "Select Sensors" screen. Here you can use everything as if you were in Standalone mode, with the only difference that the sensor data will be automatically sent to the server. You must select all the sensors that you want to measure.

In order to know what member in the cloud will receive the gathered data in this mode you must go to "Devices" tab in Libelium Cloud (The instructions to enter Libelium Cloud are a little later in this section), click on the pencil at the right on the bar of your MySignals device and then select your desired member. Now click on Update button to save the changes. You can also select a member with MySignals App while performing a Bluetooth mode connection.

Now on MySignals screen you must select all the sensors that you want to measure. Selected sensors are in blue color and unselected sensors are in gray color.



Figure: TFT Select Sensor

Once you have completed your selection you must click on “Data” button, which you can find at the left end of the bottom toolbar.

In “Data” screen you will be able to see in one glance the main information of all sensors at once. The selected sensors will be green and sensors are not selected in red.

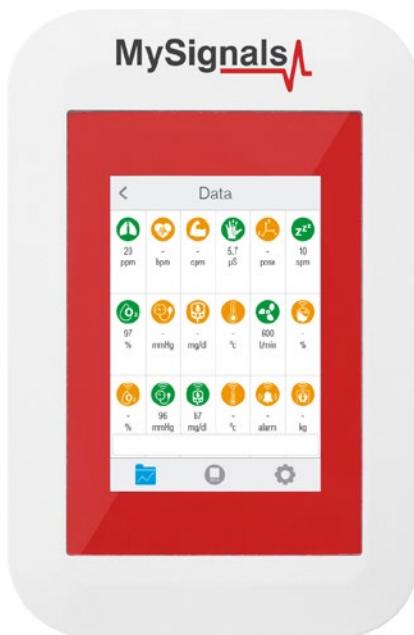


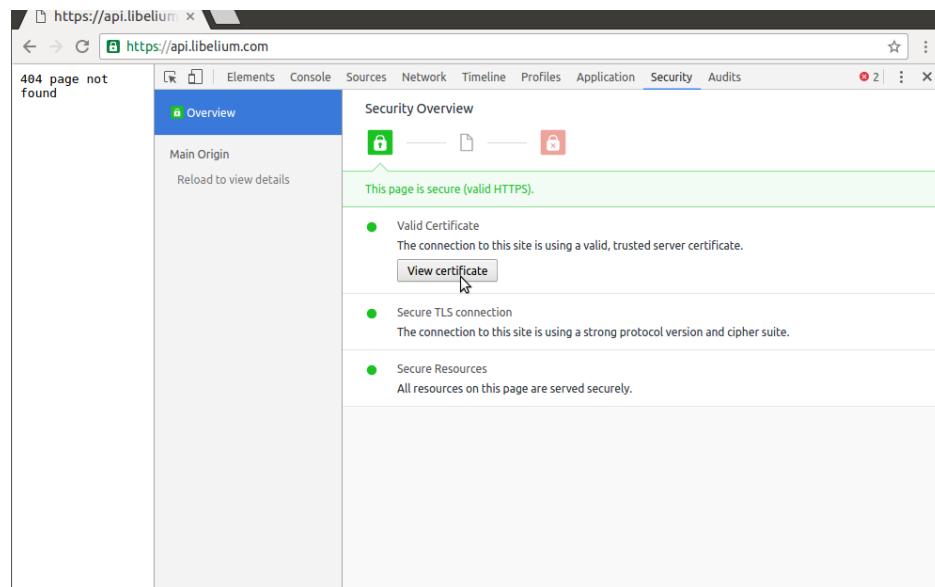
Figure: TFT General Sensor

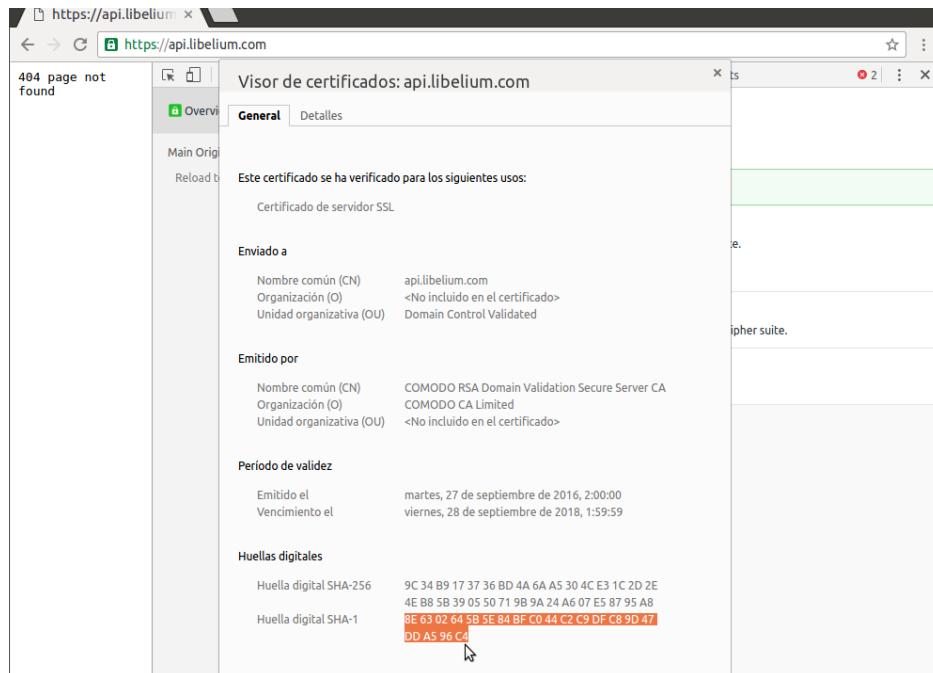
If you are interested in viewing all the information in one particular sensor simply you have to click on it to enter a detail sensor view. On this screen you can see a graph of one of the sensor values and all the detailed information on a list view.



Figure: TFT Detail Sensor

There is a possibility that over time the SHA-1 key of our servers will expire and change, in that case a message with the new SHA-1 key will appear on the MySignals display. If you want to verify that the key is correct, you only have to open a browser, open the address "<https://api.libelium.com>" and follow the following steps:





**NOTE:** At any time you can Activate / Deactivate the synchronization of the information being sent to your Cloud Account by just pressing the Cloud icon on the top right corner.

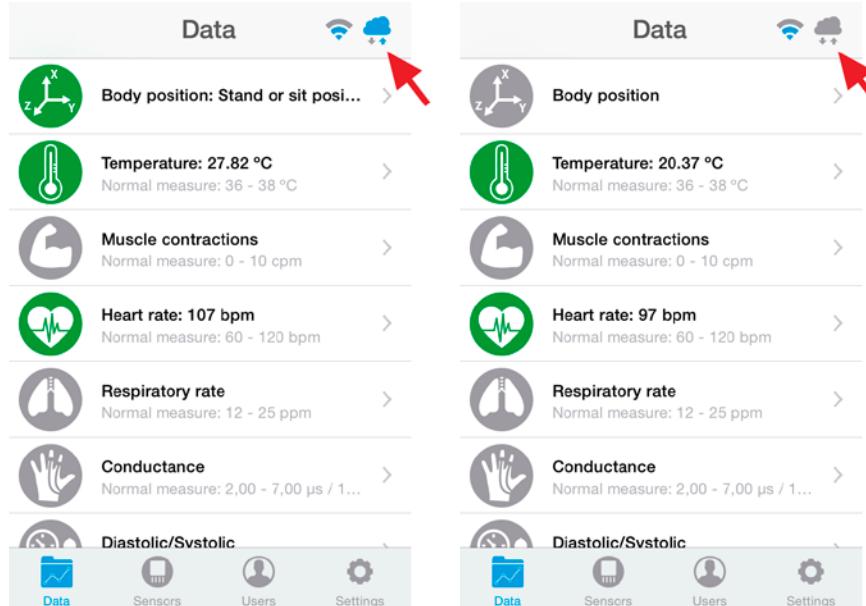


Figure: Cloud synchronization button

At any time you can navigate back to return to the previous screen by clicking the arrow on the top left of the screen.

MySignals Application will have an user account to login into the system, this account is important to make cloud call and store information. If the user does not have an account the user cannot use MySignals Application.

To access to the Libelium Cloud using your web browser go to: <https://cloud.libelium.com/MySignals/>

For information on how to create an account and activate your license please visit the point 5.2.1 of this guide

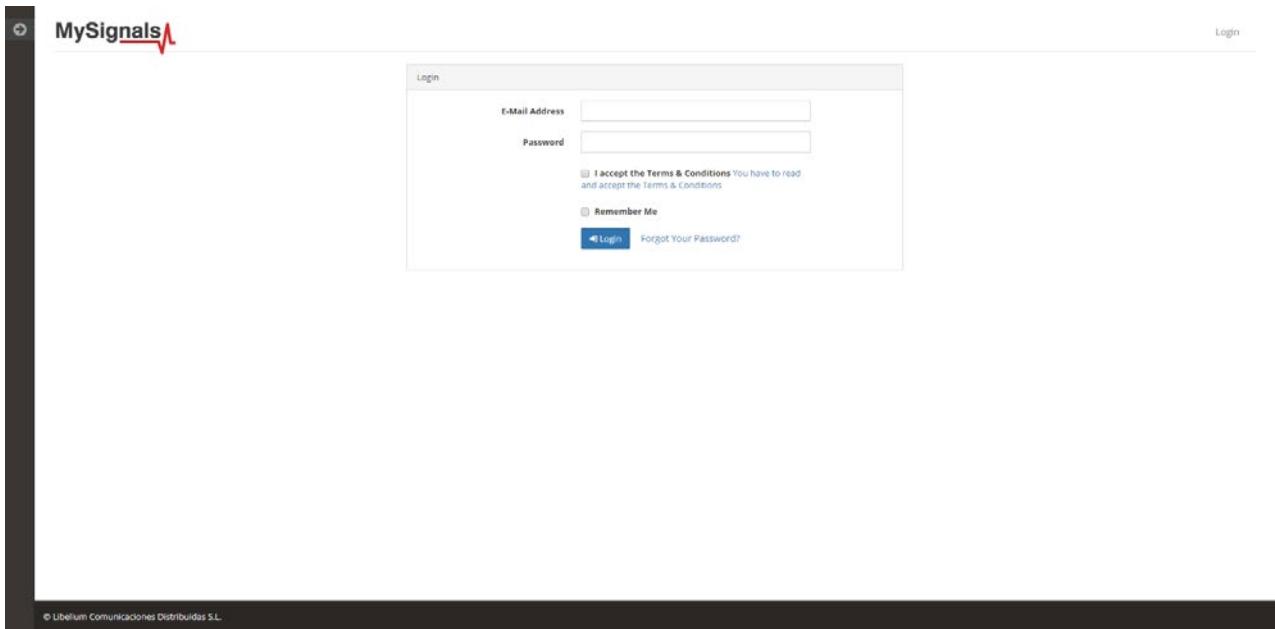


Figure: MySignals login

You can use the "Forgot your password" if you have problems with your login.

In each account you may have several user profiles. You can create, delete or modify your users.

Member	DB records (%)	DB records	Action
Adeline Ullrich		0	
Arnelle Nicolas		0	
Burnice McGlynn		0	
Clifton Marks		0	
Daryl Harvey		0	
Jacinthe Aufderhar		0	
Jonathon Watsica		0	
Kelly Schmit		0	
Kyle Mante		0	
Lazka Hertz		0	
Lourdes Guslikowski		0	
Novella Bechtelar		0	
Oliver Christiansen		0	
Rossie Worf		0	
Sasha Zbencak		0	

Figure: MySignals user

When the user starts the MySignals Application for the first time and setup assistant prompts the user will be able to create a profile once the user logs in. It will show you a "First Steps" wizard in order to help you with the profile and device configuration.

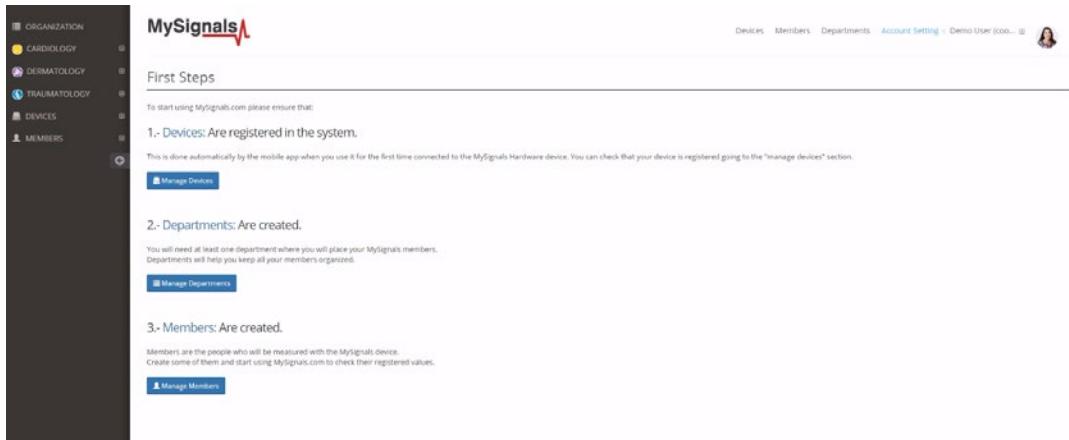


Figure: MySignals first steps

Each profile should be synchronized with cloud to be up-to-date with user information.

To configure MySignals Application for each device, we will need to set common parameters.

You can see all the data of each device or user in the user's data section. device or user in the User Data section.

Figure: User Data MySignals Web

Using the Department, User or Device configuration sections you can create, configure or delete them.

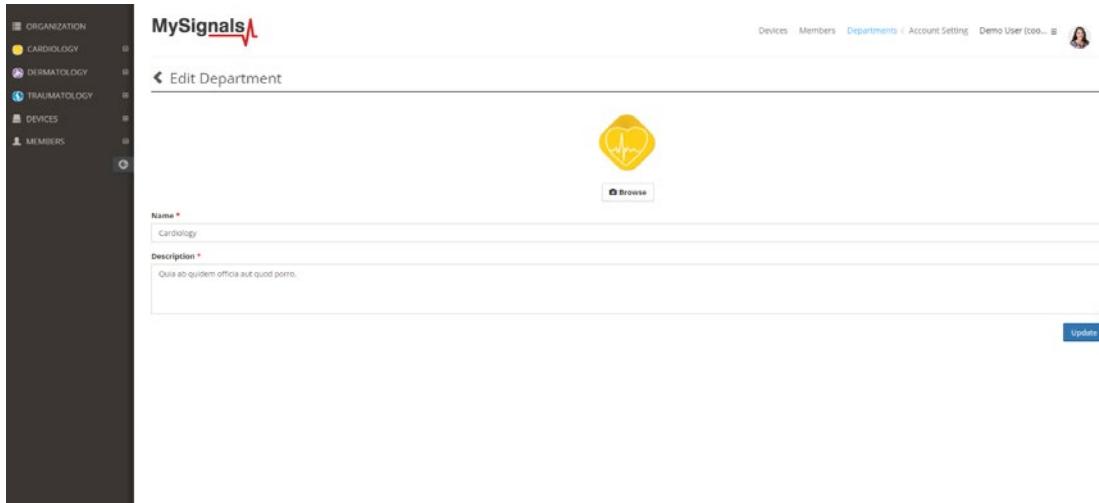


Figure: Department configuration MySignals Web

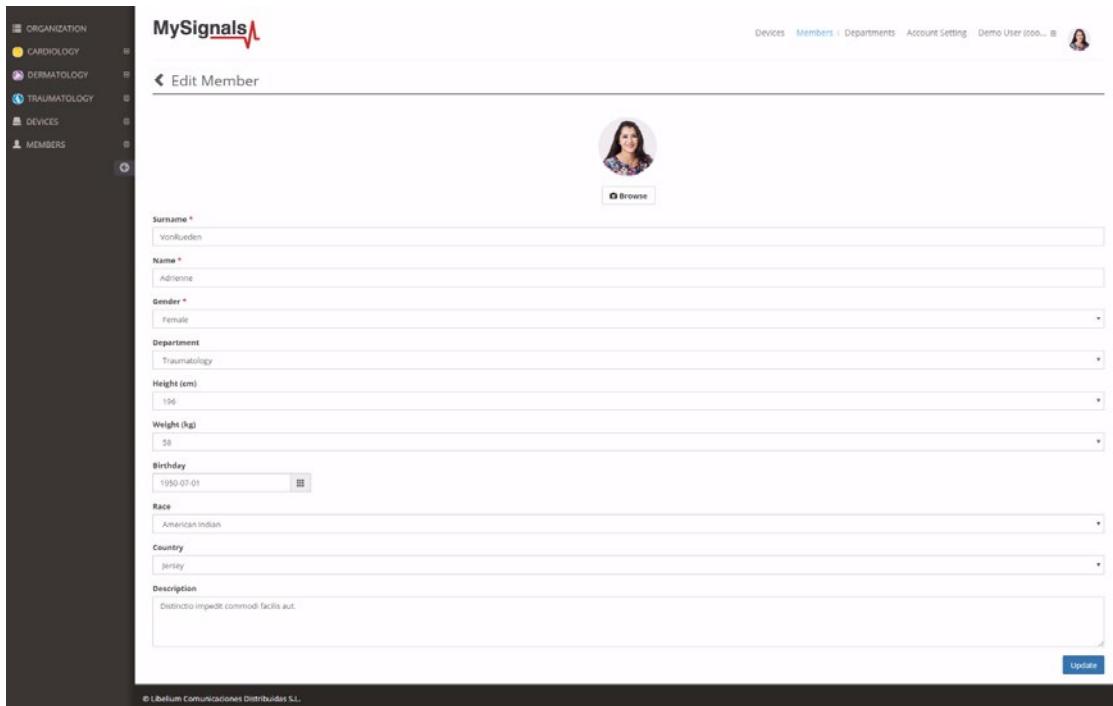


Figure: User configuration MySignals Web

MySignals

Edit Device

Name \*

Description  
Odo ratone veniam egbo non modi hic qua.

Member

Serial

Headers

Key	Value
mobile_biname	Libelium's iPhone #1
mobile_udid	6C35D96C-2657-47FA-B38E-8990533010AD
api_version	v1.0
mobile_uduid	B40F7CD3-D328-4D50-9607-888718BF38D8
device_bitmacid	70B4EA36-9D0B-04AC-59H1-A8578FCEDDF2
device_id	70B4EA36-9D0B-04AC-59H1-A8578FCEDDF2
device_firmware	v1.0
device_biname	MySignals:0955
mobile_bitmacid	B40F7CD3-D328-4D50-9607-888718BF38D8

Created

Updated

Figure: Device configuration MySignals Web

You can configure too your personal profile.

MySignals

Edit My Profile

Name \*

Password

Password confirm

Email \*

Timezone \*

I accept the [Terms & Conditions](#). You have to read and accept the Terms & Conditions

Figure: Personal profile MySignals Web

Now you can select the member or device that you want monitor.

First of all choose the sensor that you want to visualize. You can use the fast access menu situated on the left side of the Web Server.

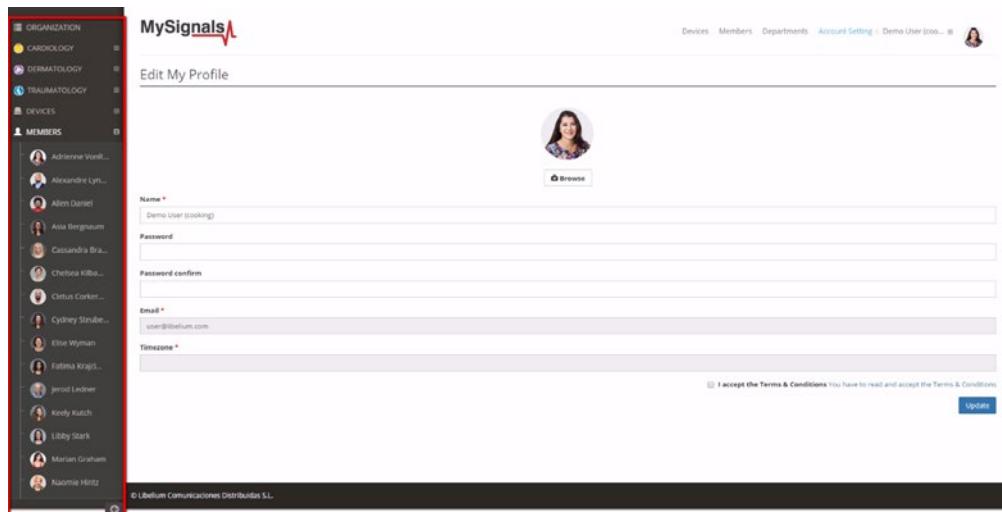


Figure: Select user

Then you can see the General Sensor page. MySignals Web Server will monitor all the parameters in General Mode where it only show numeric values.

You can see in this screen a color code in the sensor logos:

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previously connection of some time ago.
- Grey: It is that the sensor is not connected.

Name:	Anna	Height:	173 cm
Surname:	Gerhold	Weight:	104 kg
Member ID:	25	Birthday:	10 jun 1987
Last update:		Department:	Dermatology
<b>Data</b>			
	Body position	>	
	Temperature Normal measure: 36 - 38 °C	>	
	Muscle contraction (cpm) Normal measure: 0 - 10 cpm	>	
	Heart rate (bpm) Normal measure: 60 - 120 bpm	>	
	Respiratory rate (ppm) Normal measure: 12 - 25 ppm	>	
	Conductance Normal measure: 2 - 7 µS	>	
	Diastolic pressure Systolic pressure Normal measure: 40 - 80 mmHg 80 - 120 mmHg	>	
	Oxygen saturation Normal measure: 95 - 98 %	>	
	Glucose mg Normal measure: 72 - 114 mg/dl	>	
	PEF FVI Normal measure: 540 - 780 l/min 180 - 300 l	>	
	Snore rate (spm) Normal measure: 12 - 25 spm	>	
	Weight Normal measure: 40 - 120 Kg	>	
	Diastolic pressure Systolic pressure Normal measure: 40 - 80 mmHg 80 - 120 mmHg	>	
	Oxygen saturation Normal measure: 95 - 98 %	>	
	Glucose Normal measure: 72 - 144 mg/dl	>	
	EEG Attention EEG Meditation Normal measure: 30 - 50 % 30 - 50 %	>	

Figure: General mode Web Server

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

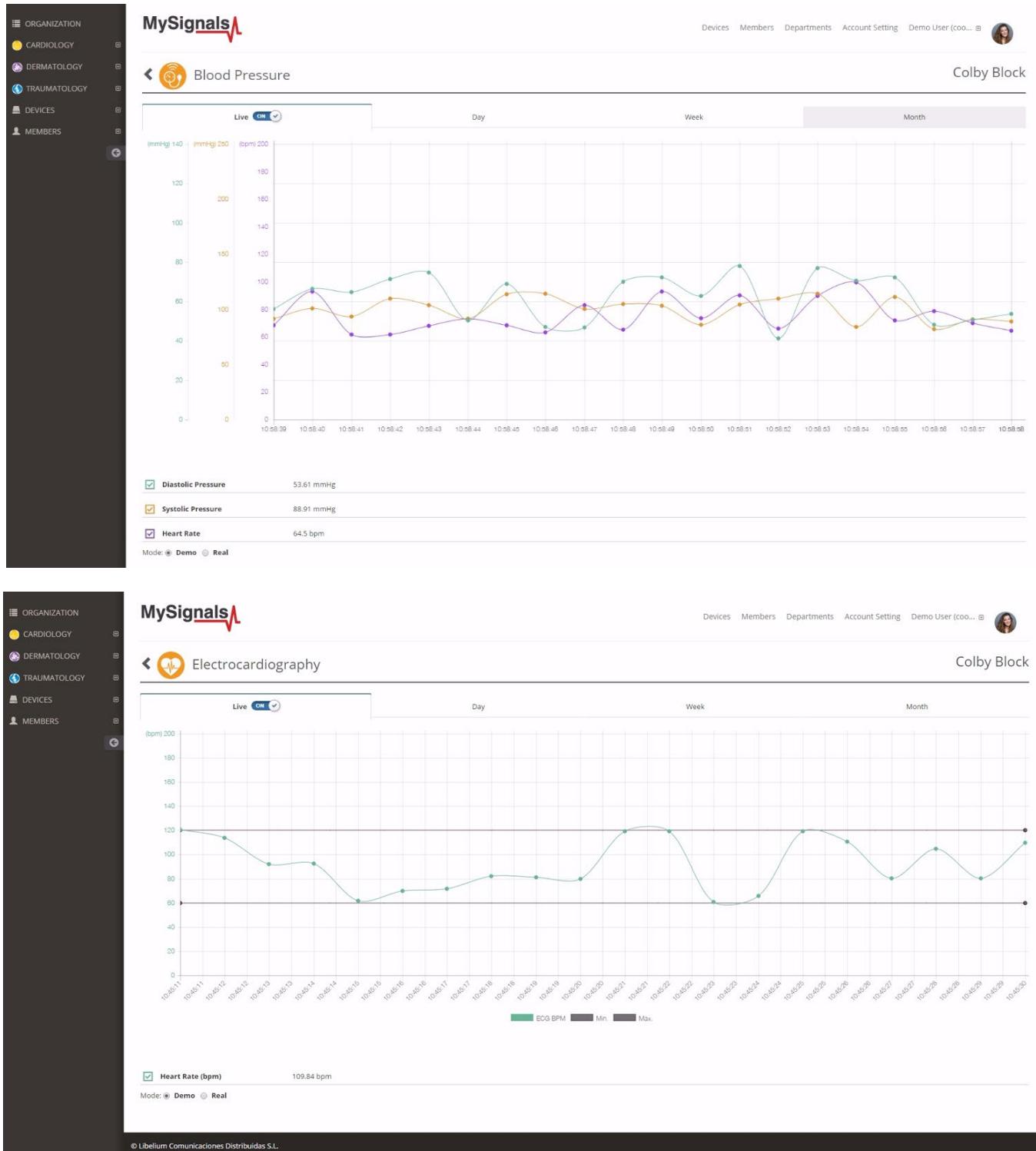


Figure: Detail mode Web Server

## Raw data viewer

A new feature has been added allowing us to see the raw data, also known as wave signal, for the sensors: Airflow, ECG, EMG and Snore.

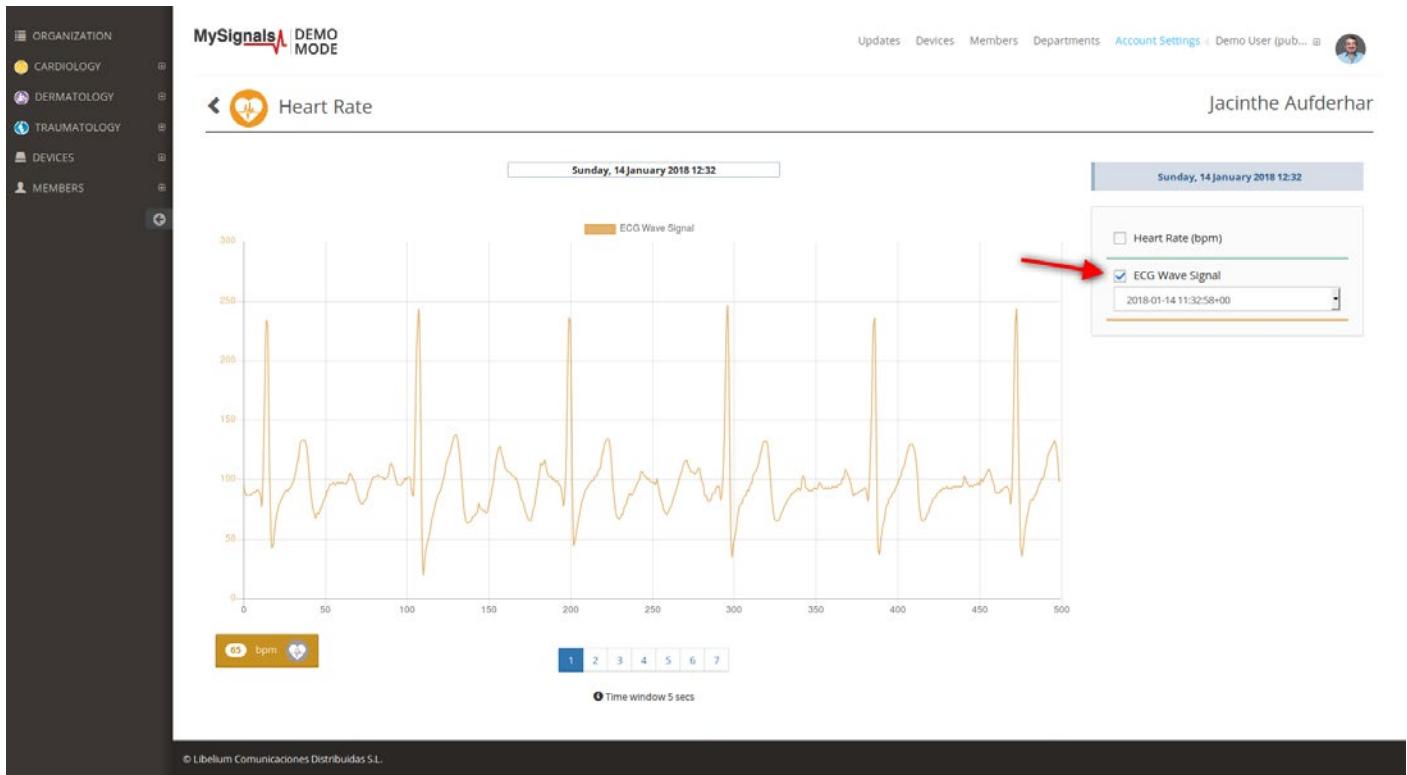
The screenshot shows the MySignals member detail page for a user named Esta Hane. The left sidebar includes sections for Organization, Cardiology (selected), Dermatology, Traumatology, Devices, and Members. The main content area is titled 'Member' and shows Esta's profile picture and basic information: Name: Esta, Surname: Hane, Member ID: 5, Last update: 2017-02-06 06:51:22-05:00. Below this is the 'Data' section, which lists various sensor readings with their normal ranges and a 'View' link. Red arrows point to the icons for Heart rate (blue heart), Muscle contraction (orange muscle), Respiratory rate (yellow lungs), and Snore rate (red zzz).

Sensor	Value	Normal Range	Action
Body position	non-defined position		>
Temperature	25.73 °C	Normal measure: 36 - 38 °C	>
Muscle contraction	0 cpm	Normal measure: 0 - 10 cpm	>
Heart rate	106 bpm	Normal measure: 60 - 120 bpm	>
Respiratory rate	0 ppm	Normal measure: 12 - 25 ppm	>
Conductance	2764.87 µS	Normal measure: 2 - 7 µS	>
Diastolic pressure	Systolic pressure	Normal measure: 40 - 80 mmHg    80 - 120 mmHg	>
Oxygen saturation		Normal measure: 95 - 98 %	>
Glucose mg		Normal measure: 72 - 114 mg/dl	>
PEF	FEV1	Normal measure: 540 - 780 l/min    180 - 300 l	>
Snore rate	(spm)	Normal measure: 12 - 25 spm	>
Weight		Normal measure: 40 - 120 Kg	>
Diastolic pressure	Systolic pressure	Normal measure: 40 - 80 mmHg    80 - 120 mmHg	>
Oxygen saturation		Normal measure: 95 - 98 %	>
Glucose		Normal measure: 72 - 144 mg/dl	>
EEG Attention	EEG Meditation	Normal measure: 30 - 50 %    30 - 50 %	>

The member detail page shows a general view of the last values received for the different sensors.

Please select one of the following sensors in order to go to the sensor detail page:

- Airflow: (Respiratory rate)
- ECG: (Heart rate)
- EMG: (Muscle contraction)
- Snore: (Snore rate)



Once in this page click the 'Wave Signal' tab.

In the bottom right of the page there is a drop down selector with the available raw values sorted by date. Select one of this an you will see the wave that was recorded using the MySignals hardware.



In the bottom center there is a pagination control that you can use for navigating the wave, going ahead and backwards in the time-line.

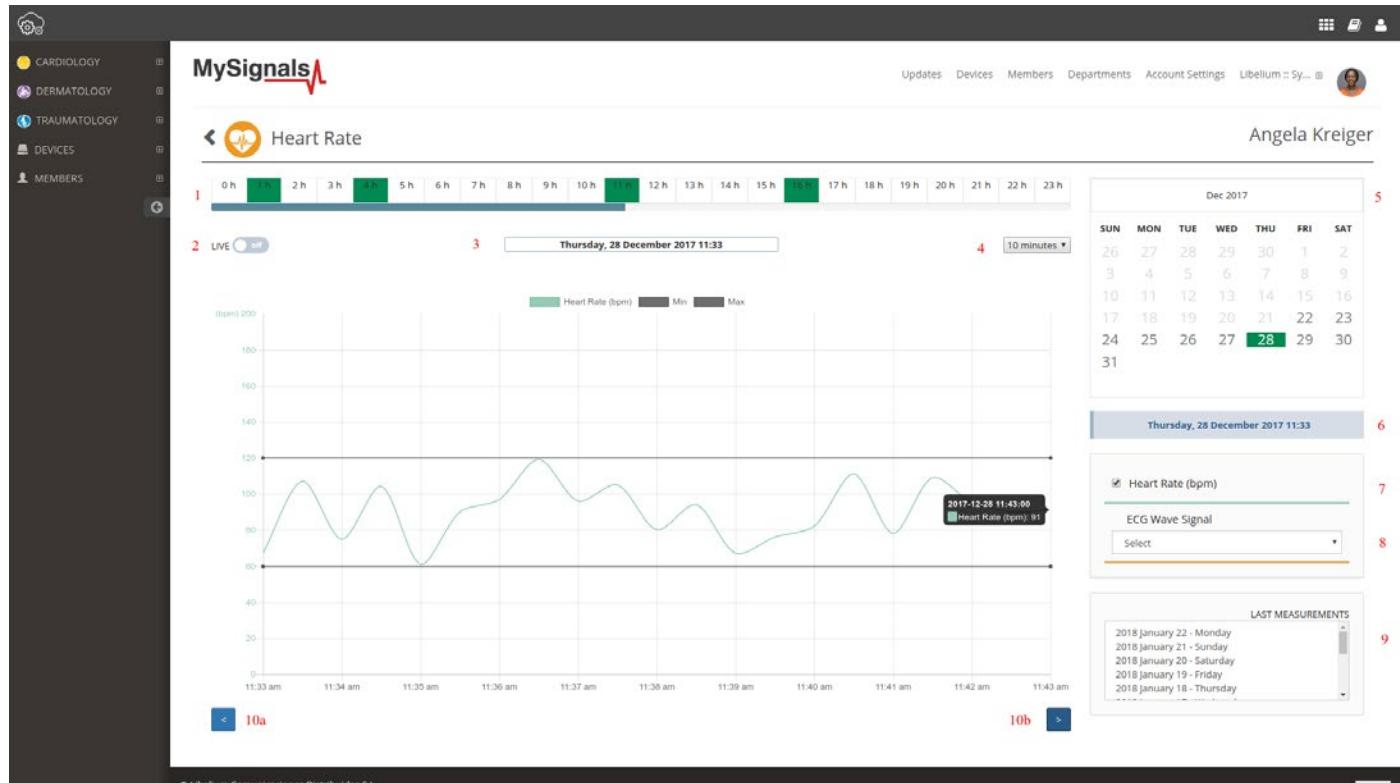


In the bottom left part of the page it's displayed the average value for bpm, ppm, cpm or spm for the entire period of the wave recorded.



## 6.3.2. Sensor detail interface

### 6.3.2.1. General view



The interface for viewing the stored measurements has the following elements.

1. Hour navigation: Shows the hours of the selected day. Green slots contain data and can be clicked to display its chart.
2. Live button: Switches between live and historical navigation mode. In live mode the chart is refreshed to represent the new data arrived to the server.
3. Datetime: Displays the date and time for the data that we are viewing.
4. Window size: Represents the size of the chart window in minutes. It works like a zoom tool.
5. Calendar navigation: Represents the days with available data stored in the server.
6. Datetime: Displays the date and time for the data that we are viewing.
7. Sensor components selector: Use this checkboxes to indicate the sensor components that you want to draw in the chart.
8. Wave Signal selector: Sensors that generate wave signals (EMG, ECG, Air Flow, Snore) displays here a list with all the stored signals. When an item is selected the signal is drawn.
9. Last measurements: Is a selector with the latest days with available data. If you recorded some data months ago this can be a quick way to find them. Note: Wave signals are not displayed here but in the "Wave Signals selector" as described in the previous point.
10. Previous and Next buttons: Is jumps to the previous or next stored measurement.

### 6.3.2.2. Sensors Detail view improvement

The sensors “**Detail view**” enables access to the history of the information previously stored. You can visualize data by choosing the month, the day and the hour.

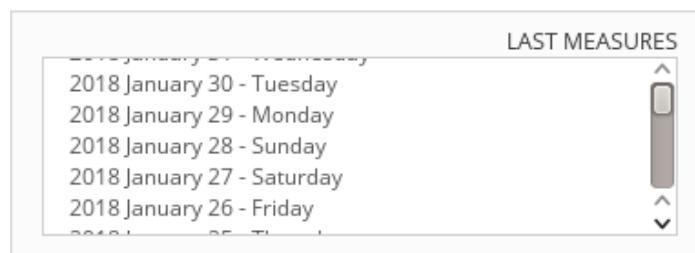


In this view, you can interact with these three elements:

- **Hour selector:** the data visualization is divided in the 24 hours of the day. Identify the slots of time which have measurements stored and select one of them to visualize the data in the graphic.
- |     |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0 h | 1 h | 2 h | 3 h | 4 h | 5 h | 6 h | 7 h | 8 h | 9 h | 10 h | 11 h | 12 h | 13 h | 14 h | 15 h | 16 h | 17 h | 18 h | 19 h | 20 h | 21 h | 22 h | 23 h |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
- **Calendar:** navigate through the months and days in order to see the history of data gathered. The days with measurements are highlighted.

Feb 2018						
SUN	MON	TUE	WED	THU	FRI	SAT
28	29	30	31	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28			

- **“Last Measures” selector:** access directly to the concrete days with measurements without navigating through the calendar.



### 6.3.3. New Admin Dashboard

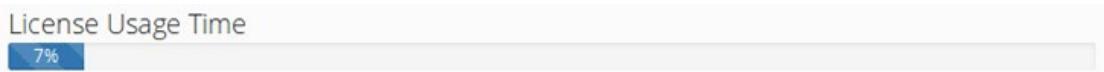
Now you can access to the Admin Dashboard to check the the **global Database Storage**, the **Traffic I/O consumption** and the **API Calls** (for the Dev Mode).

The screenshot shows the Admin Dashboard with the following sections:

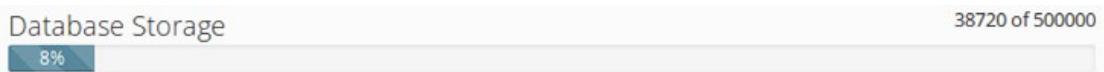
- Account Settings:** Displays basic user information (Name: Alisa Bauch, Email: a.bauch@example.com), sign-up date (2017-11-29 10:55:06), and last update (2018-02-02 12:59:27). Includes an "Edit" button.
- Usage:**
  - License Usage Time:** 7%
  - Database Storage:** 8% (38720 of 500000)
  - Database access (monthly):** 1656 of 200000 (Reset on: 2018/02/14)
  - API Calls:** 33% (2092 of 6250)
- Statistics:** Shows counts for Devices (5 / 1), Members (15 / 50), and Departments (3 / 3).
- Usage by Member:** A table showing usage for two members:

Member	DB records (%)	DB records	Action
Adaline Nolan	0	0	
Al Fritsch	0	0	

- **License Usage Time:** it shows the percentage of license duration consumed.



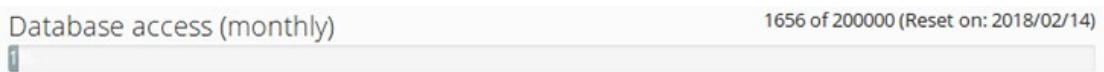
- **Database Storage:** it shows the percentage of data stored in the MySignals Cloud with respect to storage that corresponds to the license.



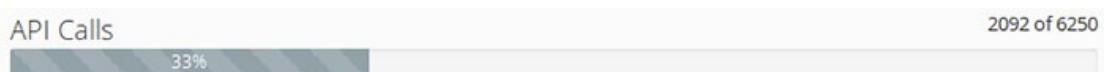
You can delete the registers of your users in order to free up space in the database using the "Usage by Member" panel.

Usage by Member				
Member	DB records (%)	DB records	Action	
Adaline Nolan	0	0		
Al Fritsch	0	0		

- **Database access:** it shows the traffic I/O consumption in a month. This data is reset monthly.



- **API Calls:** it shows the times of a third party service connects with MySignals Cloud. It is only available for Developer Plans.



### 6.3.4. Plans for Data Storage

There are plans for regular users and for developers depending on what usage you want to give to MySignals.

#### User Cloud Plans

The user plans are meant to be used to test the performance of MySignals. These are the best plans if you want to try in a quick and easy way the MySignals Kit including all the sensors on different users as each one can have its own profile. All the data is sent to the Libelium Cloud, so users do not need to set up their own servers.

	<b>Basic</b>	<b>PRO</b>	<b>Elite</b>
<b>Usage</b>	Platform testing	Small Dev. Deployment	Professional Dev. Deployment
<b>User Profiles (Members)</b>	5	50	Unlimited
<b>Departments</b>	1	10	Unlimited
<b>MySignals Devices<sup>1</sup></b>	1	1	1
<b>DB Storage</b>	0.1 GB (10 Million registers Approx)	2 GB (200 Million registers Approx)	6 GB <sup>3</sup> (600 Million registers Approx)
<b>Traffic I/O<sup>2</sup></b>	2 GB	5 GB	15 GB <sup>3</sup>
<b>Android / iOS Apps</b>	Yes	Yes	Yes
<b>Encryption Point to Point</b>	Yes	Yes	Yes
<b>Libelium Cloud Access</b>	Yes	Yes	Yes
<b>API Cloud (Necessary to extract the information to a third party servers. Check the Developer Licenses)</b>	No	No	No
<b>Price</b>	99€ / year	199€ / year	499€ / year

IMPORTANT: You can always use MySignals at no cost in the standalone and Bluetooth modes (only visualization not storage).

<sup>1</sup> Note that each licence is per MySignals Device.

<sup>2</sup> To avoid illicit use of the network, there is a daily and monthly maximum transmission rate.

<sup>3</sup> For specific plans contact our Business Dev Team ([sales@libelium.com](mailto:sales@libelium.com)).

**You can purchase the license which best suits your project from February 27<sup>th</sup>.** There will be two modalities of acquisition:

- The licenses will be available in the [IoT Marketplace](#).
- You can contact with your **Sales Area Manager** in order to make the purchase.

## Developer Cloud Plans

The developers plans are the best option for users who want to store the data gathered by MySignals in their own servers. This type of plans allow to use the Cloud API to read the information from the Libelium Cloud and write it in their own Cloud platforms.

	<b>Basic</b>	<b>PRO</b>	<b>Elite</b>
<b>Usage</b>	Platform testing	Small Dev. Deployment	Professional Dev. Deployment
<b>User Profiles (members)</b>	5	50	Unlimited
<b>Departments</b>	1	10	Unlimited
<b>MySignals Devices<sup>1</sup></b>	1	1	1
<b>DB storage</b>	0.1 GB (10 Million registers Approx)	2 GB (200 Million registers Approx)	6 GB <sup>3</sup> (600 Million registers Approx)
<b>Traffic I/O<sup>2</sup></b>	5 GB	15 GB	50 GB <sup>3</sup>
<b>Android / iOS Apps</b>	Yes	Yes	Yes
<b>Encryption Point to Point</b>	Yes	Yes	Yes
<b>Libelium Cloud Access</b>	Yes	Yes	Yes
<b>API Cloud (Necessary to extract the information to a third party servers. Check the Developer Licenses)</b>	Yes	Yes	Yes
<b>Price</b>	199€/year	299€/year	599€/year

**IMPORTANT:** You can always use MySignals at no cost in the standalone and Bluetooth modes (only visualization not storage).

<sup>1</sup> Note that each licence is per MySignals Device.

<sup>2</sup> To avoid illicit use of the network, there is a daily and monthly maximum transmission rate.

<sup>3</sup> For specific plans contact our Business Dev Team ([sales@libelium.com](mailto:sales@libelium.com)).

**You can purchase the license which best suits your project from February 27<sup>th</sup>.** There will be two modalities of acquisition:

- The licenses will be available in the [IoT Marketplace](#).
- You can contact with your **Sales Area Manager** in order to make the purchase.

### 6.3.5. How to get MySignals Cloud Plans

You can purchase the license which best suits your project from February 27<sup>th</sup>. There will be two modalities of acquisition:

- The licenses will be available in the [IoT Marketplace](#).
- You can contact with your **Sales Area Manager** in order to make the purchase.

MySignals allows to share data with the cloud, and perform real-time analysis.

MySignals Web Server Application is a real-time large-dataset viewing and plotting tool and has built-in data analysis functionality. It is very user-friendly and contains many powerful built-in features. MySignals Web Server Application is an Application that allows you to configure MySignals for creating profiles and users and help you to visualize all the data measured.

This Application is available in:

<https://cloud.libelium.com/MySignals/>

### 6.3.6. Account creation

In order to access to the MySignals web application is necessary to have SCM account and a valid license.

SCM stands for “Services Cloud Manager”, and is Libelium's platform from where you can manage your devices an Cloud Services

1.- To create a free SCM account please fill this form and click in the validation email that you will receive:

<https://cloud.libelium.com/register>.

(If additional help is needed please check the [Services Cloud Manager Guide](#))

2.- To activate your license you will need to follow this steps:

- Buy your MySignals license from Libelium's IoT Marketplace or from your Sales agent.
- You will receive in your email the License activation code
- You must click in the activation link that you will receive by email

(If additional help is needed please check the Services Cloud Manager Guide )

After this steps you can start using MySignals Cloud service with the Website, Mobile APP and Developer API, in the terms and quotas contained in the license that you purchased.

### 6.3.7. License activation

The “Licenses” section gives control of the licenses for the SCM. Licenses enable services for your devices. The “My Licenses” panel lists the currently active licenses and the historic data of all the expired licenses. If you recently purchased a License, go to the “Get Licenses” panel to enter its activation code.

License activation codes are unique and only one use is allowed (one license only applies to one user, to one account). Despite the ownership of one device can be transferred (and one device can be managed by several users), the ownership of a license cannot be transferred.

Any license has an expiration time associated to it. It is important to note that time starts running from the moment the user activates it by entering its activation code (after entering the activation code of a license, it may be required to activate it in the “Service” panel).

If the user has one active license and activates a new one, time keeps running for both the old and the new licenses (in other words, time is never paused).

The “My Licenses” panel shows the licenses and the status of each one. The “Active” tab shows the list of the licenses which are currently active, and the “Expired” tab shows the list of previously used licenses.

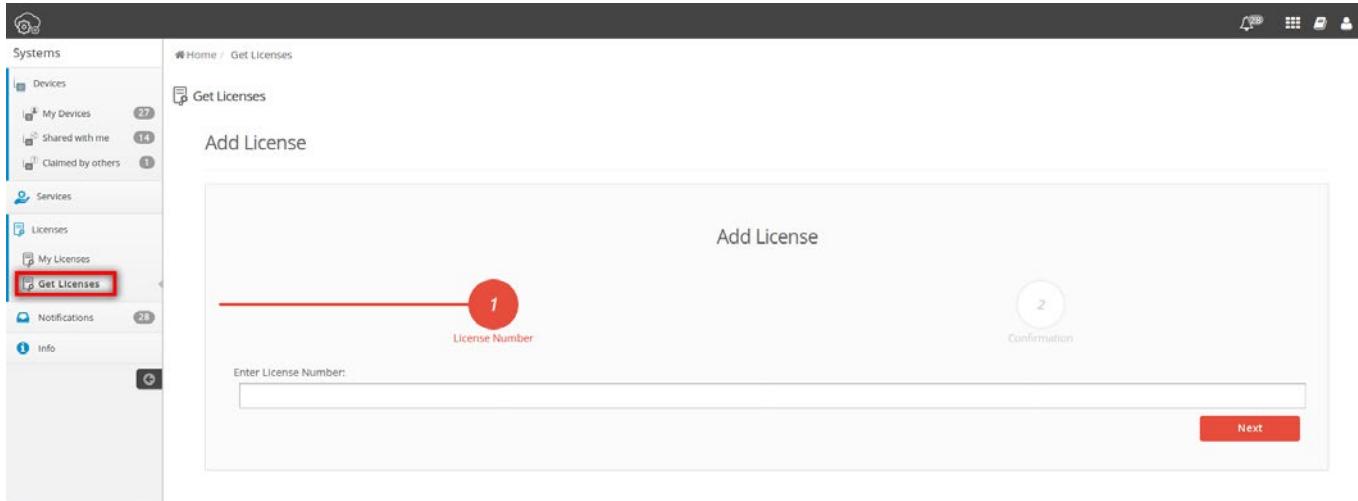


License ID	Service	Activated	Expires	Action
26966535	PCS Basic	2017-05-11	2018-05-11	<button>Upgrade</button> <button>Extend Period</button>
17654049	PCS Pro	2016-12-27	2017-12-27	<button>Upgrade</button> <button>Extend Period</button>
67134809	PCS Elite	2017-02-26	2018-02-26	<button>Extend Period</button>

The information displayed is:

- License ID: Identification number
- Service: Service and type provided by the license
- Activated: Date of activation
- Expires: Date of expiration

The MySignals Cloud Licenses activation process will be ready-to-use from February 27<sup>th</sup>. License registration is done in the “Get Licenses” panel. It is a 2-step procedure: enter a valid license activation code and confirm the action.



Entering a Single Activation Code will register one license. A Group Activation Code will register all devices belonging to the Sales Order, but not the licenses it may contain.

### Add License

This screenshot shows the 'Add License' step. The main area has a red circle labeled '1' over the 'License Number' field. Below it is a 'Enter License Number:' input field containing a blurred license number. To the right is a 'Confirmation' section with a red circle labeled '2'. A 'Next' button is at the bottom right.

### Add License

This screenshot shows the 'Confirmation' step. The main area has a red circle labeled '1' over the 'License Number' field. To the right is a 'Confirmation' section with a red circle labeled '2'. Below the 'Confirmation' section is a 'Finish' button. At the bottom left is a 'Back' button.

The SCM will validate the activation code, displaying a visual confirmation. When the process is finished successfully, a message will show that the license has been correctly added to the "My Licenses" panel.

Success!



License added

OK

If the process could not be finished correctly, a message will notify the error. For example, "invalid activation code: please check that the activation code you entered is valid".

Something went wrong



License not valid

OK

## 6.4. Using a third party Cloud

Developers may migrate the information stored in the Libelium Cloud to a third party Cloud server easily using the API Cloud provided.



### 6.4.1. Cloud API

Libelium MySignals comes with a Cloud API that allows us to read data from our account.

We can see a list our members and read the values measured for a user by MySignal.

This data available in this RESTful API can be used by the customer to create new developments.

### 6.4.2. Basic configuration

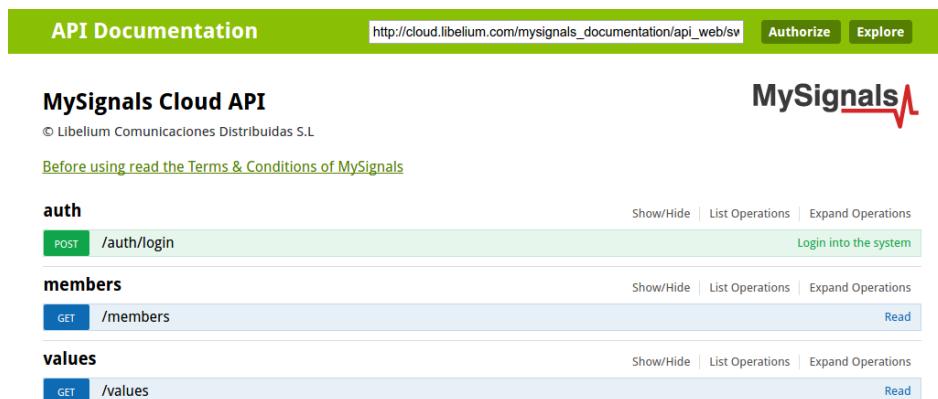
There is no need to install anything but you can go to:

[https://cloud.libelium.com/MySignals\\_documentation/api\\_web/](https://cloud.libelium.com/MySignals_documentation/api_web/)

This is the representation of the API in Swagger format.

If you already know this tool you can skip this section and go to the next section (PHP Example).

Here you can browse all the available methods of the API and see the parameters that you need to use.



The screenshot shows the MySignals Cloud API documentation page. At the top, there's a green header bar with 'API Documentation', the URL 'http://cloud.libelium.com/mysignals\_documentation/api\_web/sw', and two buttons: 'Authorize' and 'Explore'. Below the header, the title 'MySignals Cloud API' is displayed along with the copyright notice '© Libelium Comunicaciones Distribuidas S.L.' and a link to 'Before using read the Terms & Conditions of MySignals'. The main content area lists three categories: 'auth', 'members', and 'values'. Each category has its own sub-sections and operations. For 'auth', there's a 'POST /auth/login' operation with a 'Login into the system' button. For 'members', there's a 'GET /members' operation with a 'Read' button. For 'values', there's a 'GET /values' operation with a 'Read' button. Each operation row includes 'Show/Hide', 'List Operations', and 'Expand Operations' links.

Figure: API methods available

Is it possible to test the API from here following these steps:

## Method 1: Login

Click over '/auth/login', fill the form with your email and password and click 'Try it out!'. If you provided the right data you should see something like this:

The screenshot shows the API Documentation interface for the MySignals Cloud API. The URL is [http://cloud.libelium.com/mysignals\\_documentation/api\\_web/](http://cloud.libelium.com/mysignals_documentation/api_web/). The page title is "MySignals Cloud API". The main section is "auth" with the endpoint "/auth/login". The "Implementation Notes" section states: "Login into the system. It returns a token that needs to be used in all the future api calls." Below this are "Parameters" for "email" and "password", both set to placeholder values. The "Response Messages" section shows a 200 status code with a "Try it out!" button. The "Curl" section provides a command-line example for a POST request to the auth/login endpoint. The "Request URL" is <http://cloud.libelium.com/mysignals/api/auth/login>. The "Response Body" displays a JSON token: { "token": "eyJ0eXAiOiJKV1QiLCJhbGciOiJIUzI1NiJ9.eyJnd19pZCI6InN5c3RlbXNAbGliZwxpdW0uY29tIFtkZXZlbG9wZXJdIiwic3dfcG9" }.

Figure: API login

The response body contains the token that you should use to access to your data in the following steps. Click 'Authorize', write 'Bearer <your token>' and click authorize.

## Available authorizations

### Api key authorization

name:	Authorization
in:	header
value:	<input type="text" value="Bearer eyJ0eXAiOiJKV1C"/>

Figure: API add authorization token

## Method 2: Get list of your members

Click in '/members' section and then "Try it out!" button.

You should see a list with your members.

If you don't see it please make sure that you followed all the instructions of the previous step (Login).

### members

Show/Hide | List Operations | Expand Operations

GET	/members	Read												
<b>Implementation Notes</b> Get a list of the current members. This method requires authorization token (see /auth/login)														
<b>Response Messages</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>HTTP Status Code</th> <th>Reason</th> <th>Response Model</th> <th>Headers</th> </tr> </thead> <tbody> <tr> <td>200</td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="2"> <a href="#">Try it out!</a> <a href="#">Hide Response</a> </td> <td></td> <td></td> </tr> </tbody> </table>			HTTP Status Code	Reason	Response Model	Headers	200				<a href="#">Try it out!</a> <a href="#">Hide Response</a>			
HTTP Status Code	Reason	Response Model	Headers											
200														
<a href="#">Try it out!</a> <a href="#">Hide Response</a>														
<b>Curl</b> <pre>curl -X GET --header 'Accept: application/json' --header 'Authorization: Bearer eyJ0eXAiOiJKV1QiLCJhbGciOiJIUzI1NiJ9.eyJpc3MiOiJodHRwczovL2xvY2FsbGltLmNvbS9tZXRhL2FwaS9hcGkiLCJ9.eyJzdWIiOiIxMjM0NTY3ODkwIiwibmFtZSI6IkJhZGFnZSIsImV4cCI6MTUxOTkxNzQyM30=</pre>														
<b>Request URL</b> <input type="text" value="http://cloud.libelium.com/mysignals/api/members"/>														
<b>Response Body</b> <pre>{   "data": [     {       "id": 9,       "name": "Adah",       "surname": "Okuneva",       "picture": "http://cloud.libelium.com/mysignals/uploads/members/W47zuphkHgE10Dux.jpg",       "description": "In dolor optio harum consectetur.",       "height": "158",       "weight": "114",       "birthday": "1974-04-12",     }   ] }</pre>														

Figure: API members list

### Method 3: Get the sensor values of a member

Click '/values' section and fill the parameters as in the picture. Then click "Try it out!" button.

#### values

[Show/Hide](#) | [List Operations](#) | [Expand Operations](#)

GET	/values	Read		
<b>Implementation Notes</b> Get sensor values of a member. This method requires authorization token (see /auth/login)				
<b>Parameters</b>				
Parameter	Value	Description	Parameter Type	Data Type
<b>sensor_id</b>	<b>temp</b>		query	string
<b>member_id</b>	<b>1</b>		query	integer
<b>ts_start</b>	<b>2016-01-01 00:00:00</b>		query	date-time
<b>ts_end</b>	<b>2017-01-01 00:00:00</b>		query	date-time
<b>limit</b>	<b>5</b>		query	integer
<b>cursor</b>	<b>0</b>		query	integer
<b>order</b>	<b>desc</b>		query	string
<b>Response Messages</b>				
HTTP Status Code	Reason	Response Model	Headers	
<b>200</b>				
<a href="#">Try it out!</a> <a href="#">Hide Response</a>				
<b>Curl</b> <pre>curl -X GET --header 'Accept: application/json' --header 'Authorization: Bearer eyJ0eXAiOiJKV1QiLCJhbGciOiJIUzI1NiJ9.eyJ0eXAiOiJKV1QiLCJhbGciOiJIUzI1NiJ9.eyJpc3MiOiJsb2dpbi5saWJlZWluLmNvbSIsInN1YiI6ImFjY2VzcC1sb2dpbi1sb2dpbiJ9.eY</pre>				
<b>Request URL</b> <pre>http://cloud.libelium.com/mysignals/api/values?sensor_id=temp&amp;member_id=1&amp;ts_start=2016-01-01%2000%3A00%3A00&amp;ts_end=2017-01-01%2000%3A00%3A00</pre>				
<b>Response Body</b> <pre>{   "data": [     {       "id": 44383,       "value": "29.46",       "ts": "2016-09-28 05:10:59",       "sensor_id": "temp",       "member_id": 1     },     {       "id": 44202,       "value": "33.54",       "ts": "2016-09-28 02:09:59",       "sensor_id": "temp",       "member_id": 1     },     {       "id": 43642,       "value": "33.95",       "ts": "2016-09-27 16:49:59",       "sensor_id": "temp",       "member_id": 1     }   ] }</pre>				

The previous method requires specifying the sensor\_id. Alternatively there is another method that allows to request all the last values registered for all the sensors.

Click '/values/last\_member\_data/' section and fill the parameters as in the picture. Then click "Try it out!" button.

**GET /values/last\_member\_data** Read

**Implementation Notes**  
 Get last sensor values of a member.  
 This method requires authorization token (see /auth/login)

**Parameters** ?

Parameter	Value	Description	Parameter Type	Data Type
member_id	<input type="text" value="8"/>		query	integer

**Response Messages**

HTTP Status Code	Reason	Response Model	Headers
200			

[Try it out!](#) [Hide Response](#)

**Curl**

```
curl -X GET --header 'Accept: application/x.webapi.v1+json' --header 'Authorization: Bearer eyJ0eXAiOiJKV1QiLCJhbGciOiJ
```

**Request URL**

[https://api.libelium.com/mysignals/values/last\\_member\\_data?member\\_id=8](https://api.libelium.com/mysignals/values/last_member_data?member_id=8)

**Response Body**

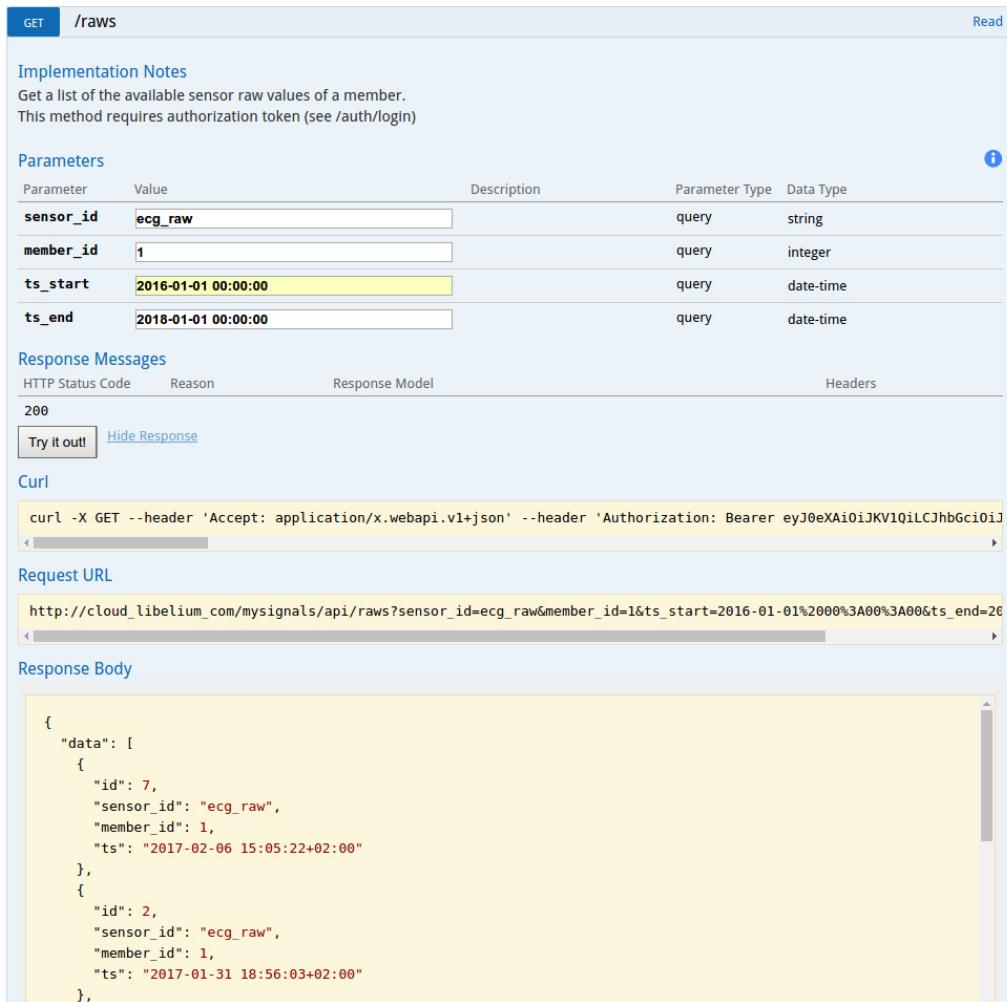
```
{
  "id": 17328008,
  "value": "4",
  "ts": "2017-05-08 15:02:28+02:00",
  "sensor_id": "position",
  "member_id": 8
},
{
  "id": 17328009,
  "value": "0.06",
  "ts": "2017-05-08 15:02:28+02:00",
  "sensor_id": "position_x",
  "member_id": 8
},
{
  "id": 17328010,
  "value": "0.12",
  "ts": "2017-05-08 15:02:28+02:00",
  "sensor_id": "position_y",
  "member_id": 8
},
```

Available values for sensor\_id are:

sensor_id	name	units
position	Body position	1 supine, 2 left, 3 right, 4 prone, 5 stand or sit, 6 non-defined
position_x	X axis acc	g
position_y	X axis acc	g
position_z	X axis acc	g
temp	Temperature	°C
emg_cpm	Muscle contraction	cpm
ecg_bpm	Heart rate	bpm
airflow_ppm	Respiratory rate	ppm
gsr_us	Conductance	µs
gsr_ohms	Resistance	ohms
blood_dias	Diastolic pressure	mmHg
blood_syst	Systolic pressure	mmHg
blood_bpm	Heart rate	bpm
spo2_oxy	Oxygen saturation	%
spo2_bpm	Heart rate	bpm
gluco_mg	Glucose mg	mg/dl
gluco_mol	Glucose mmol	mmol/l
spir_pef	PEF	spir_pef
spir_fev	FEV1	spir_fev
snore_spm	Snore rate	spm
scale_ble_weight	Wheight	kg
scale_ble_bodyfat	Bodyfat	%
scale_ble_bonemass	Bonemass	%
scale_ble_musCLEmass	MusCLEmass	%
scale_ble_visceralfat	Visceralfat	%
scale_ble_water	Water	%
scale_ble_calories	Calories	kcal
blood_ble_dias	Diastolic pressure	mmHg
blood_ble_syst	Systolic pressure	mmHg
blood_ble_bpm	Heart rate	bpm
spo2_ble_oxy	Oxygen saturation	%
spo2_ble_bpm	Heart rate	bpm
gluco_ble_mg	Glucose	mg/dl
gluco_ble_mmol	Glucose mmol	mmol/l
eeg_ble_attention	EEG Attention	%
eeg_ble_meditation	EEG meditation	%
temp_ble	Temperature	°C
button_ble	Alarm button	0 off, 1 on

## Method 4: Get a list of sensor raw data

Click '/raws' section and fill the parameters as in the picture. Then click "Try it out!" button.



**Implementation Notes**  
Get a list of the available sensor raw values of a member.  
This method requires authorization token (see /auth/login)

**Parameters**

Parameter	Value	Description	Parameter Type	Data Type
sensor_id	ecg_raw		query	string
member_id	1		query	integer
ts_start	2016-01-01 00:00:00		query	date-time
ts_end	2018-01-01 00:00:00		query	date-time

**Response Messages**

HTTP Status Code	Reason	Response Model	Headers
200			

**Curl**

```
curl -X GET --header 'Accept: application/x.webapi.v1+json' --header 'Authorization: Bearer eyJ0eXAiOiJKV1QiLCJhbGciOiJ
```

**Request URL**

```
http://cloud.libelium.com/mysignals/api/raws?sensor_id=ecg_raw&member_id=1&ts_start=2016-01-01%2000%3A00%3A00&ts_end=2018-01-01%2000%3A00%3A00
```

**Response Body**

```
{
  "data": [
    {
      "id": 7,
      "sensor_id": "ecg_raw",
      "member_id": 1,
      "ts": "2017-02-06 15:05:22+02:00"
    },
    {
      "id": 2,
      "sensor_id": "ecg_raw",
      "member_id": 1,
      "ts": "2017-01-31 18:56:03+02:00"
    }
  ]
}
```

Available values for sensor\_id are:

sensor_id	name
airflow_raw	Airflow Wave Signal
ecg_raw	ECG Wave Signal
emg_raw	EMG Wave Signal
snore_raw	Snore Wave Signal

The method returns a list of the available raw data that can be requested in detail with the following method.

## Method 5: Get detail of sensor raw data

Click '/raws/{id}' section and fill the parameters as in the picture. Then click "Try it out!" button.

GET /raws/{id} Read by id

**Implementation Notes**  
Get sensor raw values.  
This method requires authorization token (see /auth/login)

**Parameters**

Parameter	Value	Description	Parameter Type	Data Type
<b>id</b>	<input type="text" value="7"/>		path	string

**Response Messages**

HTTP Status Code	Reason	Response Model	Headers
200			

**Curl**

```
curl -X GET --header 'Accept: application/x.webapi.v1+json' --header 'Authorization: Bearer eyJ0eXAiOiJKV1QiLCJhbGciOiJ
```

**Request URL**

```
http://cloud.libelium.com/mysignals/api/raws/7
```

**Response Body**

```
{
  "data": {
    "id": 7,
    "sensor_id": "ecg_raw",
    "member_id": 1,
    "ts": "2017-02-06 15:05:22+02:00",
    "values_json": {
      "parts_received": 1,
      "parts_total": 1,
      "period_ms": 10,
      "values": [
        97,
        89,
        87,
        87,
        87,
        88,
        89,
        89,
        89
      ]
    }
  }
}
```

### 6.4.3. PHP example

There is an example that you can download from:

[http://downloads.libelium.com/MySignals/MySignals\\_web/api\\_cloud\\_v1.zip](http://downloads.libelium.com/MySignals/MySignals_web/api_cloud_v1.zip)

1.- Extract the zip with the example

2.- Download the 'httpfull' library and place it in the /includes directory

<http://phphttpclient.com/downloads/httpful.phar>

3.- Edit the file example.php and fill \$email and \$password with your values

4.- Go to your web browser and load the example.php page

This will log you in the system, get a list of your members and get the latest 5 temperature values of one of your users.

```
/*
 *
 * Copyright (C) 2016 Libelium Comunicaciones Distribuidas S.L.
 * http://www.libelium.com
 *
 * This program is distributed WITHOUT ANY WARRANTY; without
 * even the implied warranty of MERCHANTABILITY or FITNESS FOR A
 * PARTICULAR PURPOSE.
 *
 * By using it you accept the MySignals Terms and Conditions.
 * You can find them at: http://libelium.com/legal
 *
 *
 * Version:          0.1
 * Design:          David Gascon
 */

include('includes/httpful.phar');

// Config
$email = 'your@email.com';
$password = 'your_password';

// API Vars
$api_base = 'https://api.libelium.com/MySignals';
$api_headers = ['Accept' => 'Application/x.webapi.v1+json'];

//1.- Login
$parameters = json_encode([
    'email' => $email,
    'password' => $password
]);
$response_login = \Httpful\Request::post($api_base . '/auth/login')
    ->sendsJson()
    ->body($parameters)
    ->addHeaders($api_headers)
    ->send();
echo "1.- Login: <br><br>".$response_login->raw_body."<hr><br>";

//Save the Token in the header array.
if($response_login->code == 200){
    $api_headers['Authorization'] = 'Bearer ' . $response_login->body->token;
}
```

```
//2.- Get mymembers
$response_members = \Httpful\Request::get($api_base . '/members')
    ->addHeaders($api_headers)
    ->send();

echo "2.- Get my members: <br><br><pre>".json_encode($response_members->body, JSON_PRETTY_PRINT)."</pre><hr><br>";

//3.- Get values from the first of my members
if(count($response_members->body->data) >= 1){
    $member_id = $response_members->body->data[0]->id;

    $parameters = [
        'member_id' => $member_id,
        'sensor_id' => 'temp',
        'ts_start' => '2015-01-01 00:00:00',
        'ts_end' => '2017-01-01 00:01:00',
        'limit' => '5',
        'cursor' => '0',
        'order' => 'desc'
    ];
    $response_values = \Httpful\Request::get($api_base . '/values?' . http_build_query($parameters))
        ->addHeaders($api_headers)
        ->send();

    echo "3.- Get values from one member (member_id= ".$member_id."): <br><br><pre>".json_encode($response_values->body, JSON_PRETTY_PRINT)."</pre><hr><br>";
```

## 7. Sensors

MySignals allows you to measure more than 15 different biometric parameters such as pulse, breath rate, oxygen in blood, electrocardiogram signals, blood pressure, muscle electromyography signals, glucose levels, galvanic skin response, lung capacity, snore waves, patient position, airflow and body scale parameters (weight, bone mass, body fat, muscle mass, body water, visceral fat, Basal Metabolic Rate and Body Mass Index). These broad sensing portfolio makes MySignals the most complete eHealth platform in the market.

We offer broad range of both wired and wireless sensors:

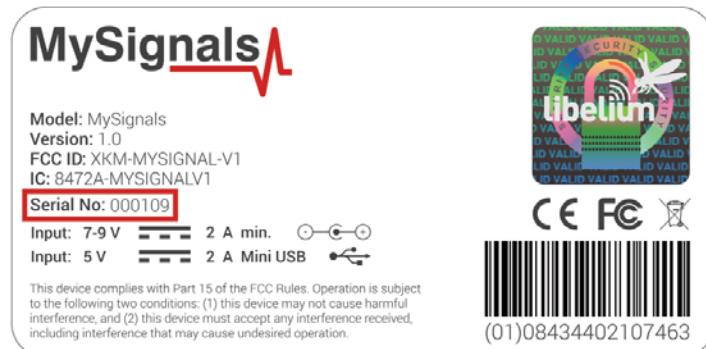


Figure: MySignals Software Development Platform with Sensors

- MySignals Pulsioximeter SPO2
- MySignals Electrocardiogram (ECG)
- MySignals AirFlow
- MySignals Blood pressure monitor
- MySignals Glucometer
- MySignals Temperature
- MySignals Electromyography (EMG)
- MySignals Spirometer
- MySignals Galvanic Skin Response (GSR)
- MySignals Body Position
- MySignals Snore
- MySignals Scale (BLE)
- MySignals Pulsioximeter SPO2 (BLE)
- MySignals Blood pressure monitor (BLE)
- MySignals Glucometer (BLE)
- MySignals Alarm button (BLE)

This information is used to monitor in real time the state of a user or to get sensitive data in order to be subsequently analyzed for biometric analysis. Biometric information gathered can be wireless sent using two connectivity options integrated available: Wi-Fi or Bluetooth Low Energy 4.0.

If the ID of your device is 109 or higher you are using the new model with this new feature.



## 7.1. Wired Sensors

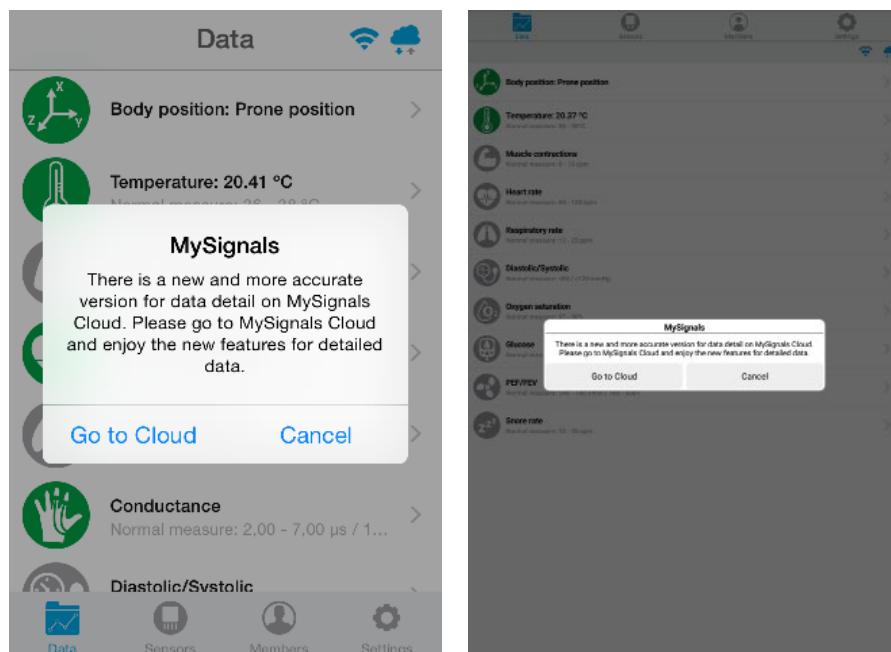
MySignals Software Development Platform can work with 11 different wired biometric sensors.

MySignals has a new improved connection system. It is very easy-to-use jack-connectors method.



Figure: MySignals Software Development Platform with Wired Sensors

**NOTE:** All detail screen for sensors on Mobile applications were replaced for a completely new web detail on MySignals Cloud, if you click onto a sensor in iPhone or Android application you will get a popup message pointing the new MySignals Cloud, there you can enjoy the new features for each sensor detail.



## 7.1.1. Pulse and Oxygen in Blood (SPO2)

### 7.1.1.1. Sensor features

**Description:** Pulse oximetry a noninvasive method of indicating the arterial oxygen saturation of functional hemoglobin.

Oxygen saturation is defined as the measurement of the amount of oxygen dissolved in blood, based on the detection of Hemoglobin and Deoxyhemoglobin. Two different light wavelengths are used to measure the actual difference in the absorption spectra of HbO<sub>2</sub> and Hb. The bloodstream is affected by the concentration of HbO<sub>2</sub> and Hb, and their absorption coefficients are measured using two wavelengths 660 nm (red light spectra) and 940 nm (infrared light spectra). Deoxygenated and oxygenated hemoglobin absorb different wavelengths.



Figure: Pulse and Oxygen in Blood (SPO2)

Deoxygenated hemoglobin (Hb) has a higher absorption at 660 nm and oxygenated hemoglobin (HbO<sub>2</sub>) has a higher absorption at 940 nm . Then a photo-detector perceives the non-absorbed light from the LEDs to calculate the arterial oxygen saturation.

A pulse oximeter sensor is useful in any setting where a patient's oxygenation is unstable, including intensive care, operating, recovery, emergency and hospital ward settings, pilots in unpressurized aircraft, for assessment of any patient's oxygenation, and determining the effectiveness of or need for supplemental oxygen.

Acceptable normal ranges for patients are from 95 to 99 percent, those with a hypoxic drive problem would expect values to be between 88 to 94 percent, values of 100 percent can indicate carbon monoxide poisoning.

#### Measurement:

Parameter	Unit	Range
Pulse	ppm	25~250 ppm
SPO2	%	35-100%

This sensor uses 2 AAA batteries.

### 7.1.1.2. Connecting the sensor

Connect the sensor in the SPO2 connector indicated in the MySignals Hardware board. The sensor cable have only one way of connection to prevent errors and make the connection easier. Use the mini-USB connector to link the SPO2 with the MySignals board, using the jack connector of the cable in this side.



Figure: MySignals Hardware Development Platform with SPO2 connected

Place the SPO2 on your finger as shown in the image below.



Figure: SPO2 connection diagram

Insert your finger into the sensor and press ON button.

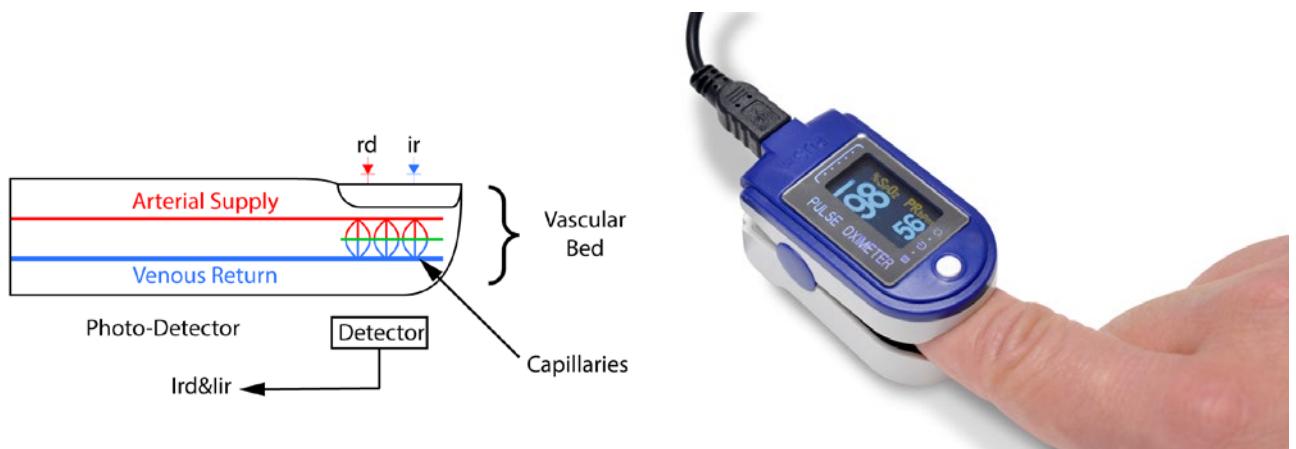


Figure: MySignals Hardware Development Platform with SPO2 situated in the user body

After a few seconds you will get the values in the sensor screen and in the visualization method programmed.

## 7.1.1.3. Examples of use

### Standalone Mode

This is an example of sensor measuring in Standalone Mode.

First of all select the sensor that you want to measure in the Select Sensors screen. Use the touchscreen pressing in the correct simbol. You can see the selected sensors logos in blue color.



Figure: Selected sensor logo

Then you can go to General Sensor screen using the left down corner logo. MySignals will start to monitor all the parameters in General Mode where it only show numeric values.



Figure: General mode and selecting general mode

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

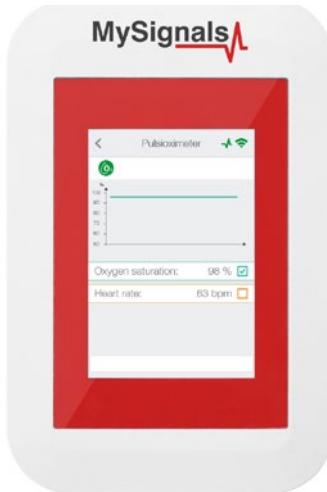


Figure: Detail mode

## MySignals App

This is an example of sensor viewing in MySignals App Mode.

First of all select the sensor that you want to measure in the Select Sensors screen. Use your smartphone touchscreen pressing in the correct simbol. You can see the selected sensors logos in blue color.

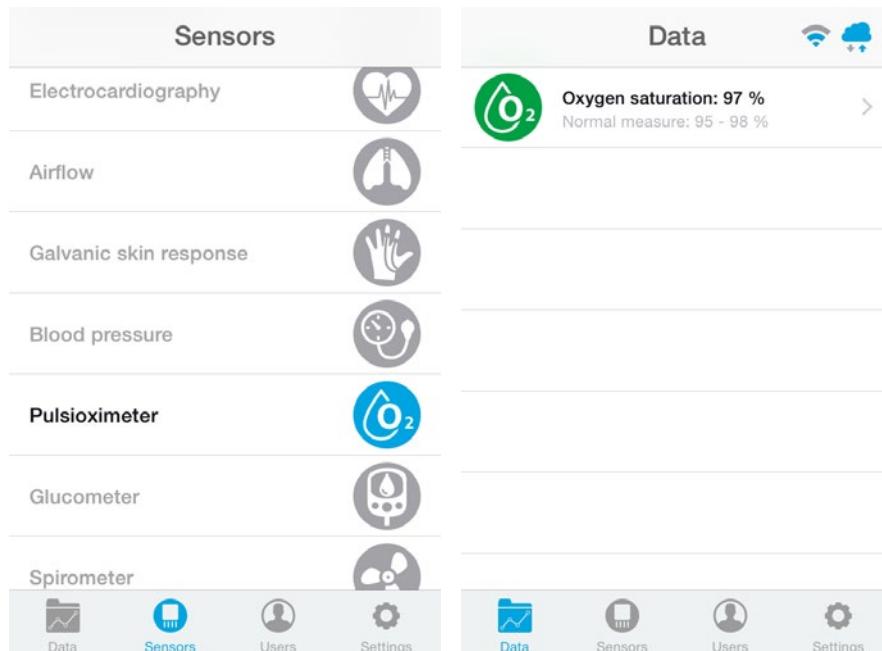


Figure: Selected sensor logo App

Then you can go to General Sensor screen using the left down corner logo. MySignals will start to monitor all the parameters in General Mode where it only show numeric values.

You can see in this screen a color code in the sensor logos:

-  Green: It is a real-time value measured in MySignals Software
-  Orange: It is a old value measured in a previously connection of some time ago.
-  Grey: It is that the sensor is not connected.



The figure displays two screenshots of the MySignals app interface. The left screenshot shows the 'Sensors' screen with a list of available sensors: Electrocardiography, Airflow, Galvanic skin response, Blood pressure, Pulsioximeter, Glucometer, and Spirometer. Each sensor has a corresponding icon next to its name. The right screenshot shows the 'Data' screen for the Pulsioximeter sensor. It displays the current oxygen saturation reading of 97%, with a note that it is a normal measure between 95-98%. The top of the screen also shows connectivity icons for Wi-Fi and cloud.

Figure: General mode and selecting general mode App

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

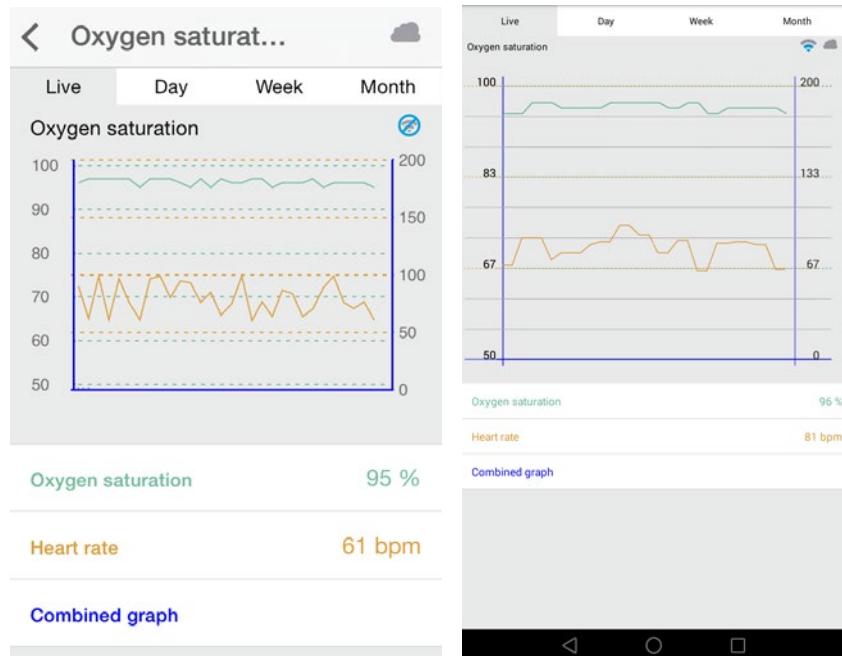
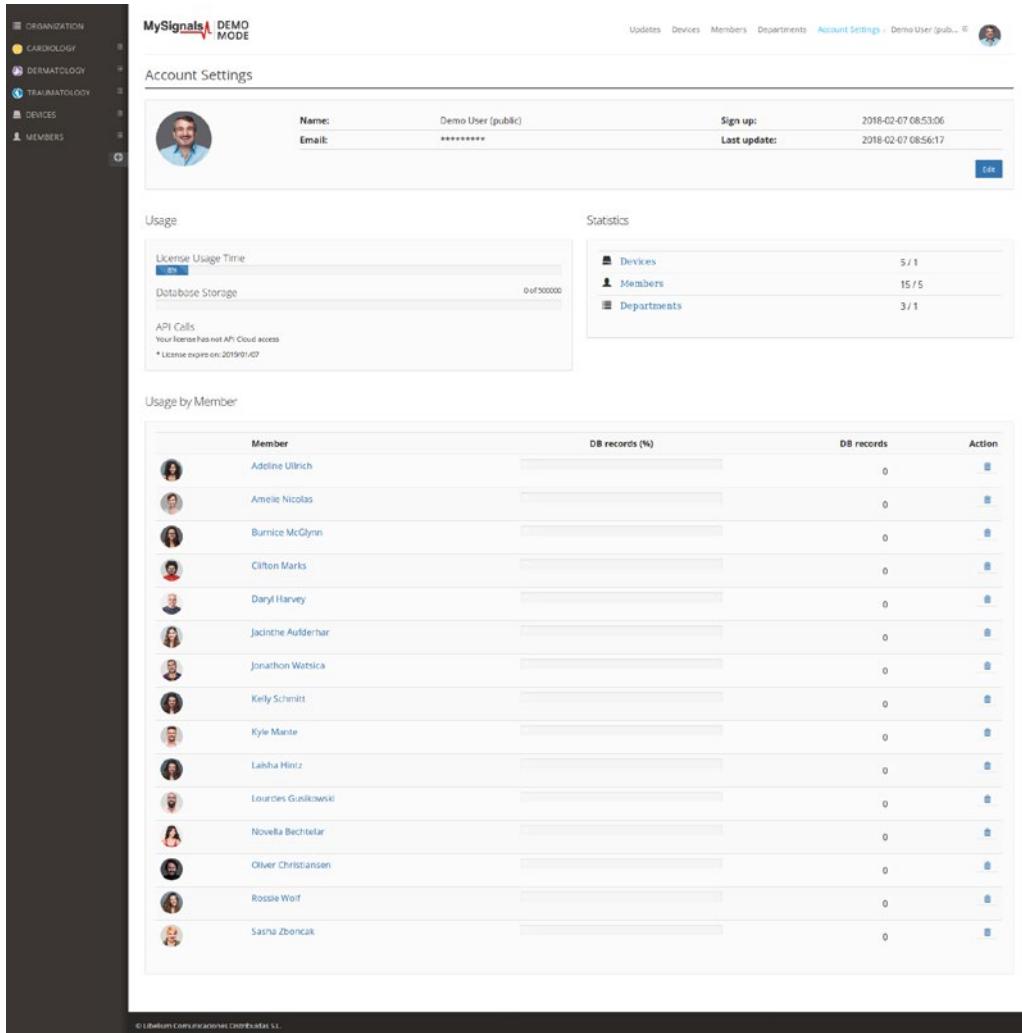


Figure: Detail mode

## MySignals Web Server

This is an example of sensor viewing in MySignals Web Server Mode.

First of all choose the sensor that you want to visualize. You can use the fast menu situated in the left side of the Web Server. Choose an user.



The screenshot shows the 'Account Settings' page of the MySignals Web Server. On the left, a sidebar lists categories: ORGANIZATION, CARDIOLOGY, DERMATOLOGY, TRAUMATOLOGY, DEVICES, and MEMBERS. The main content area has tabs for 'Updates', 'Devices', 'Members', 'Departments', and 'Account Settings'. The 'Account Settings' tab is active. It displays the following information:

- Name:** Demo User (public)
- Email:** \*\*\*\*\*
- Sign up:** 2018-02-07 08:53:06
- Last update:** 2018-02-07 08:56:17
- 504** (button)

**Usage** section:

- Licence Usage Time: 2018-02-07 08:53:06
- Database Storage: 0 of 500000
- API Calls: Your license has not API Cloud access. \* License expire on: 2019/01/07

**Statistics** section:

	Devices	Members	Departments
Devices	5 / 1	15 / 5	3 / 1

**Usage by Member** section:

Member	DB records (%)	DB records	Action
Adeline Ulrich	0	0	edit
Amelie Nicolas	0	0	edit
Burnice McGlynn	0	0	edit
Clifton Marks	0	0	edit
Daryl Harvey	0	0	edit
Jacinthe Auferhar	0	0	edit
Jonathon Watsica	0	0	edit
Kelly Schmitt	0	0	edit
Kyle Mante	0	0	edit
Lainha Hintz	0	0	edit
Lourdes Guslowski	0	0	edit
Novella Bechtelar	0	0	edit
Oliver Christiansen	0	0	edit
Rossie Wolf	0	0	edit
Sasha Zboracik	0	0	edit

At the bottom, it says: © Libelium Comunicación Distribuidor S.L.

Figure: Select user

You can select an upload to the cloud time interval in WiFi setting of 10, 20, 30 or 60 seconds.

Then you can see the General Sensor page. MySignals Web Server will monitor all the parameters in General Mode where it only show numeric values.

You can see in this screen a color code in the sensor logos:

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previously connection of some time ago.
- Grey: It is that the sensor is not connected.

The screenshot shows the MySignals web interface in General mode. On the left, a sidebar lists organizational categories: CARDIOLOGY, DERMATOLOGY, TRAUMATOLOGY, DEVICES, and MEMBERS. The MEMBERS section shows a list of users: Anna Gerhold, Brady Kules, Jody Goldner, Lavern Konopka, and Shana Turcott, each with a small profile picture. The main content area has a header "MySignals" with a red heart icon. Below it, a "Member" section displays basic information for "Anna": Name (Anna), Surname (Gerhold), Member ID (29), Last update (empty), Height (173 cm), Weight (104 kg), Birthday (10 Jun 1987), and Department (Dermatology). A "Data" section follows, listing various sensors with their normal ranges:

- Body position
- Temperature (Normal measure: 36 - 38 °C)
- Muscle contraction (cpm) (Normal measure: 0 - 10 cpm)
- Heart rate (bpm) (Normal measure: 60 - 120 bpm)
- Respiratory rate (ppm) (Normal measure: 12 - 25 ppm)
- Conductance (Normal measure: 2 - 7 µS)
- Diastolic pressure Systolic pressure (Normal measure: 40 - 80 mmHg / 80 - 120 mmHg)
- Oxygen saturation (Normal measure: 90 - 98 %)
- Glucose mg (Normal measure: 72 - 114 mg/dL)
- PEF FEV1 (Normal measure: 540 - 780 L/min / 180 - 300 L)
- Snore rate (spm) (Normal measure: 12 - 25 spm)
- Weight (Normal measure: 40 - 120 Kg)
- Diastolic pressure Systolic pressure (Normal measure: 40 - 80 mmHg / 80 - 120 mmHg)
- Oxygen saturation (Normal measure: 95 - 98 %)
- Glucose (Normal measure: 72 - 144 mg/dL)
- EEG Attention EEG Meditation (Normal measure: 30 - 50 % / 30 - 50 %)

Figure: General mode Web Server

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

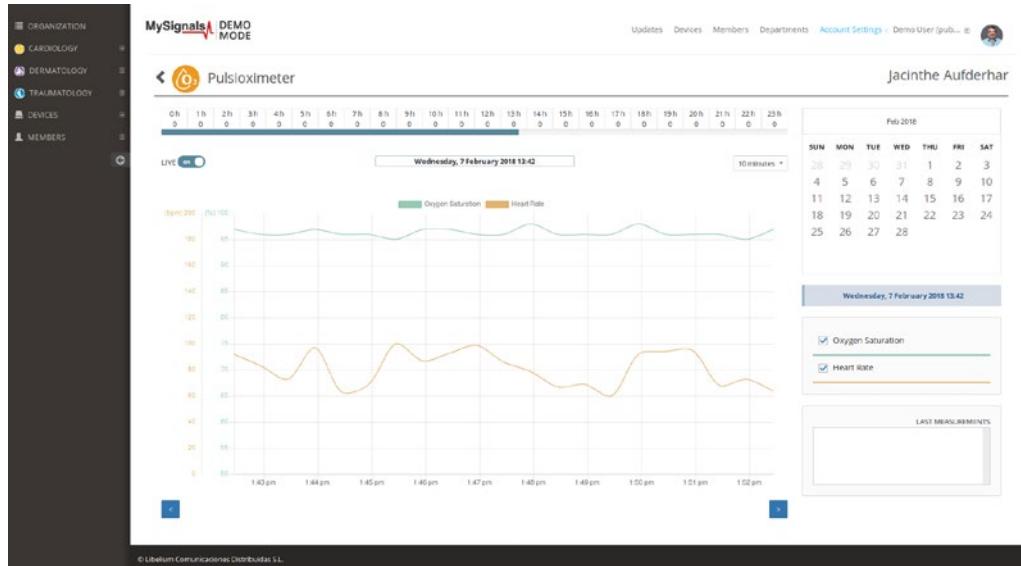


Figure: Detail mode Web Server

You can change the interval that configure MySignals to send data to the server. Introduce the value in seconds. MySignals will send data to the server as it is configured.

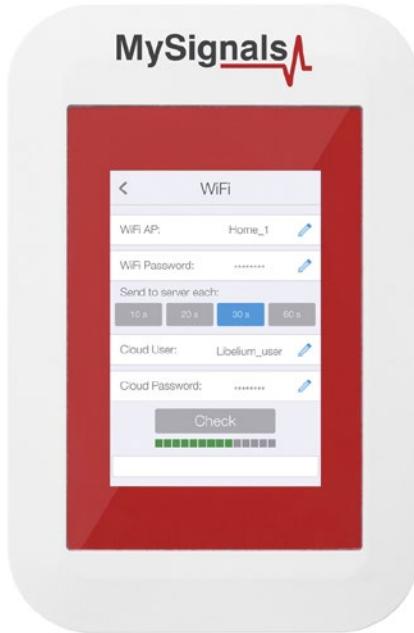


Figure: WiFi settings

## 7.1.2. ECG

The Electrocardiogram Sensor (ECG) has grown to be one of the most commonly used medical tests in modern medicine. Its utility in the diagnosis of a myriad of cardiac pathologies ranging from myocardial ischemia and infarction to syncope and palpitations has been invaluable to clinicians for decades.

*The accuracy of the ECG depends on the condition being tested. A heart problem may not always show up on the ECG. Some heart conditions never produce any specific ECG changes. ECG leads are attached to the body while the patient lies flat on a bed or table.*

### 7.1.2.1. Sensor features

**Description:** The electrocardiogram (ECG) is a diagnostic tool that is routinely used to assess the electrical and muscular functions of the heart. The sensor use "Continuous telemetry electrocardiogram" for a prolonged monitoring including the use of three ECG electrodes.



Figure: ECG Sensor

The sensor needs to be connected to the specific ECG jack connector in MySignals board and it works with direct connector power supply.

#### What is measured or can be detected on the ECG (EKG)?

- The orientation of the heart (how it is placed) in the chest cavity.
- Evidence of increased thickness (hypertrophy) of the heart muscle.
- Evidence of damage to the various parts of the heart muscle.
- Evidence of acutely impaired blood flow to the heart muscle.
- Patterns of abnormal electric activity that may predispose the patient to abnormal cardiac rhythm disturbances.
- The underlying rate and rhythm mechanism of the heart.

## Schematic representation of normal ECG

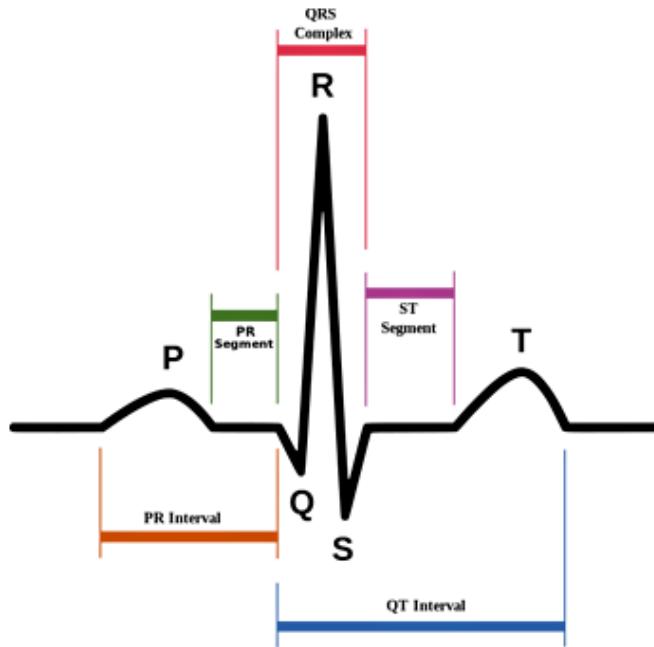


Figure: ECG Signal representation

### Measurement:

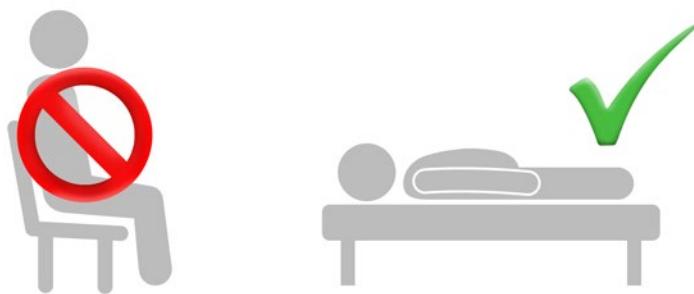
Parameter	Unit	Range
Pulse rate	BPM (Beats per minute)	0-200 bpm
Electrocardiogram signal	Volts	0-5V

### 7.1.2.2. Connecting the sensor

Connect the ECG Electrodes to the ECG sensor before placing them in the user body.



The ECG signals need to be measured with the user lying down on the bed or stretcher.



Connect the jack sensor in the ECG connector indicated in the MySignals Hardware board. The sensor cable have only one way of connection to prevent errors and make the connection easier.



Figure: MySignals Hardware Development Platform with ECG connected

Connect the ECG lead to the electrodes.



Figure: ECG connecting ECG electrodes

**NOTE:** Connect the ECG Electrodes to the ECG sensor before placing them in the user body.

Remove the protective plastic. You can use a specific conductive gel in order to improve the quality signal of the sensor.



Figure: ECG electrodes removing protective plastic

This sensor use disposable pre-gelled electrodes.

These high quality disposable electrodes are to be used to measure EEG, ECG and EMG. They are to be used once and are very handy because of integrated gel. They adhere very well to the skin and are clean to use.

The snap-on connector can easily be pushed on or removed from the electrode lead.

Place the electrodes as shown below.

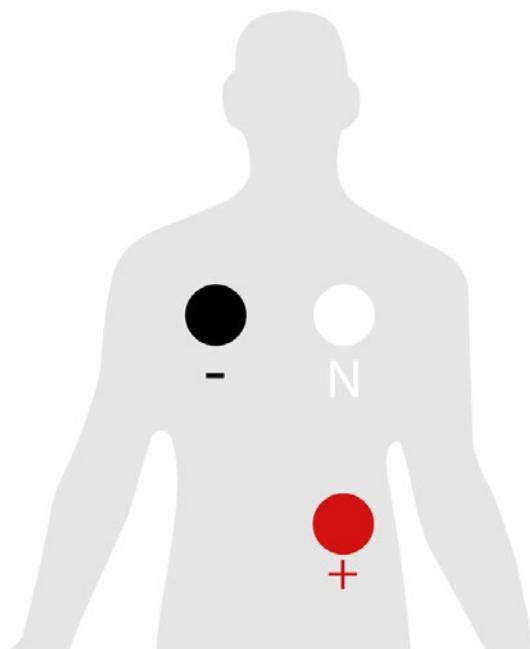
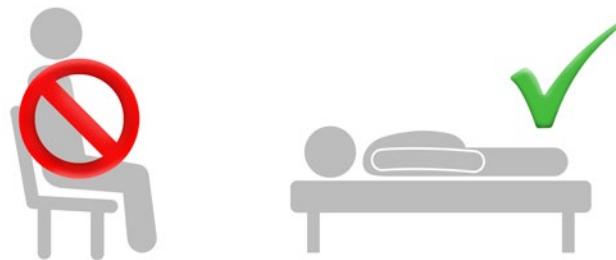


Figure: ECG position diagram

After a few seconds you will get the values in the visualization method programmed.



**NOTE:** The ECG signals need to be measured with the user lying down on the bed or stretcher.

**NOTE:** *The sensor is designed to work on a user in supine position and under conditions of maximum relaxation. It is recommended not use this sensor in environments with excessive electromagnetic noise.*

## 7.1.2.3. Examples of use

### Standalone Mode

This is an example of sensor measuring in Standalone Mode.

First of all select the sensor that you want to measure in the Select Sensors screen. Use the touchscreen pressing in the correct simbol. You can see the selected sensors logos in blue color.



Figure: Selected sensor logo

Then you can go to General Sensor screen using the left down corner logo. MySignals will start to monitor all the parameters in General Mode where it only show numeric values.

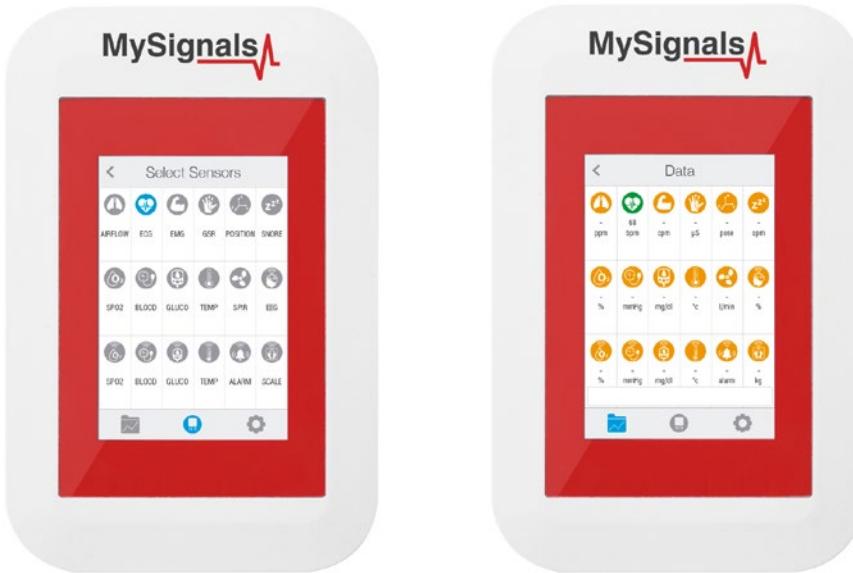


Figure: General mode and selecting general mode

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

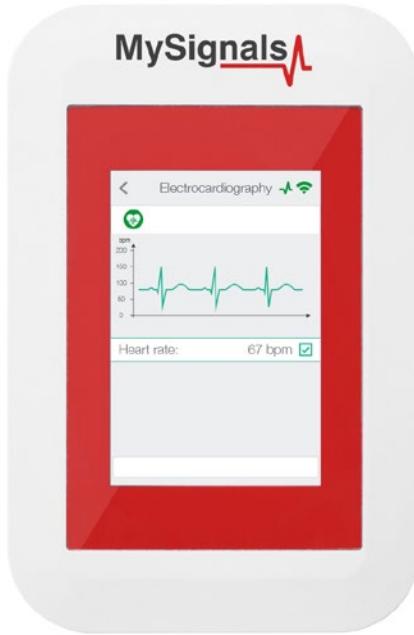
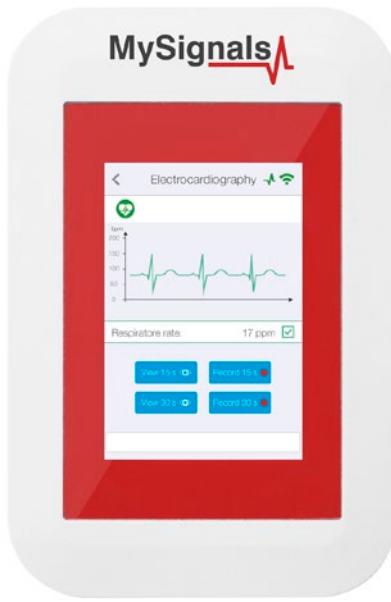


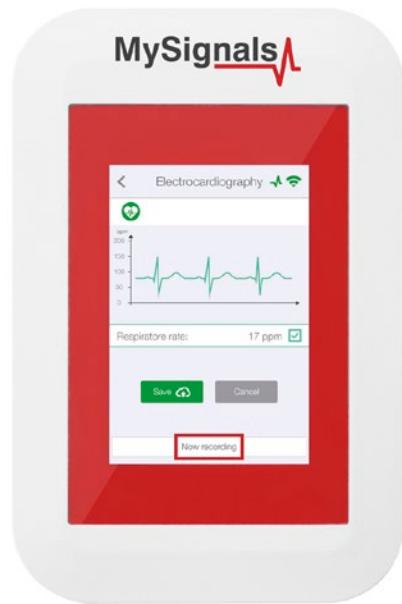
Figure: Detail mode

In September 2017 we have released new Firmware, Apps and Cloud versions that allow to record continuous waves and send them to record continuous waves and send them to the Cloud (in Server Mode). You can record 15 or 30 seconds of the data measured in detail mode of **ECG, EMG, Snore** and **Airflow**.



You can use this new function in Server Mode using detail mode. Use the **Record 15 seconds** or **Record 30 seconds** buttons in order to start a new record.

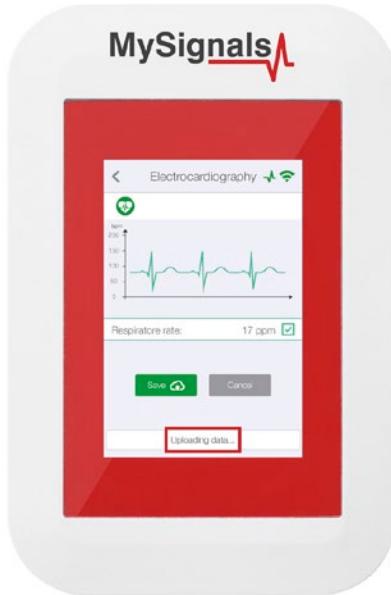
Note that you must use **View 15 seconds** or **View 30 seconds** buttons each time you want to see the wave in the screen.



With the record finished you can choose between saving this record in the cloud or cancel it.



You will see all the information about the upload to the cloud at the bottom of the screen (text message zone).



After a correct upload you will see the date of the file saved. Then you can see this new raw data file in the Web Server or in the Mobile App.



## MySignals App

This is an example of sensor viewing in MySignals App Mode.

First of all select the sensor that you want to measure in the Select Sensors screen. Use your smartphone touchscreen pressing in the correct simbol. You can see the selected sensors logos in blue color.



Figure: Selected sensor logo App

Then you can go to General Sensor screen using the left down corner logo. MySignals will start to monitor all the parameters in General Mode where it only show numeric values.

You can see in this screen a color code in the sensor logos:

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previously connection of some time ago.
- Grey: It is that the sensor is not connected.

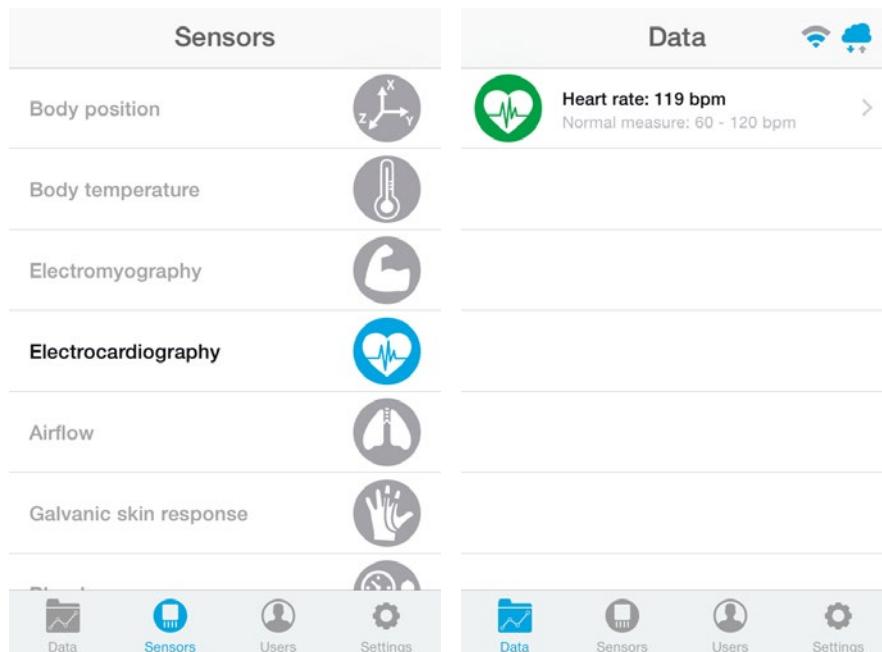


Figure: General mode and selecting general mode App

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

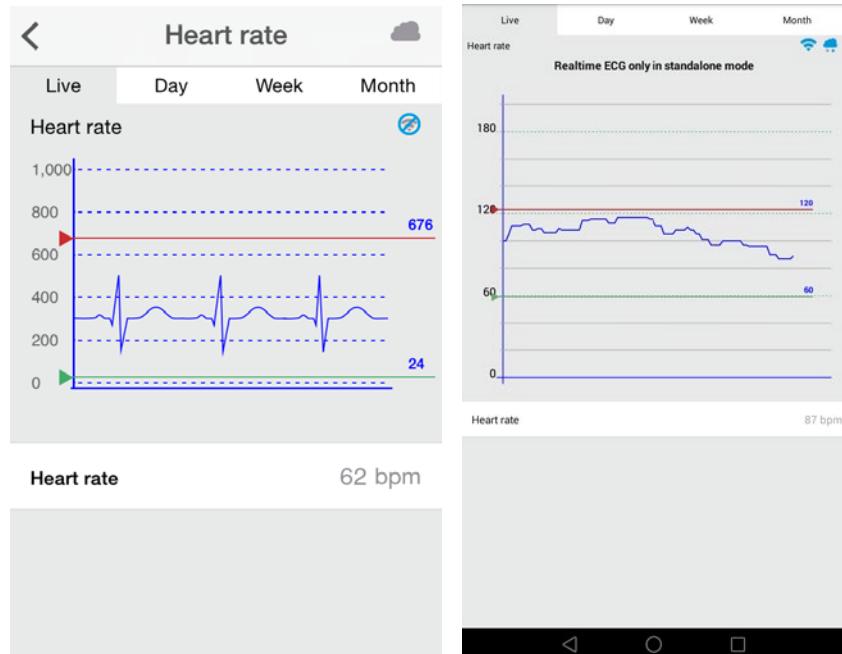
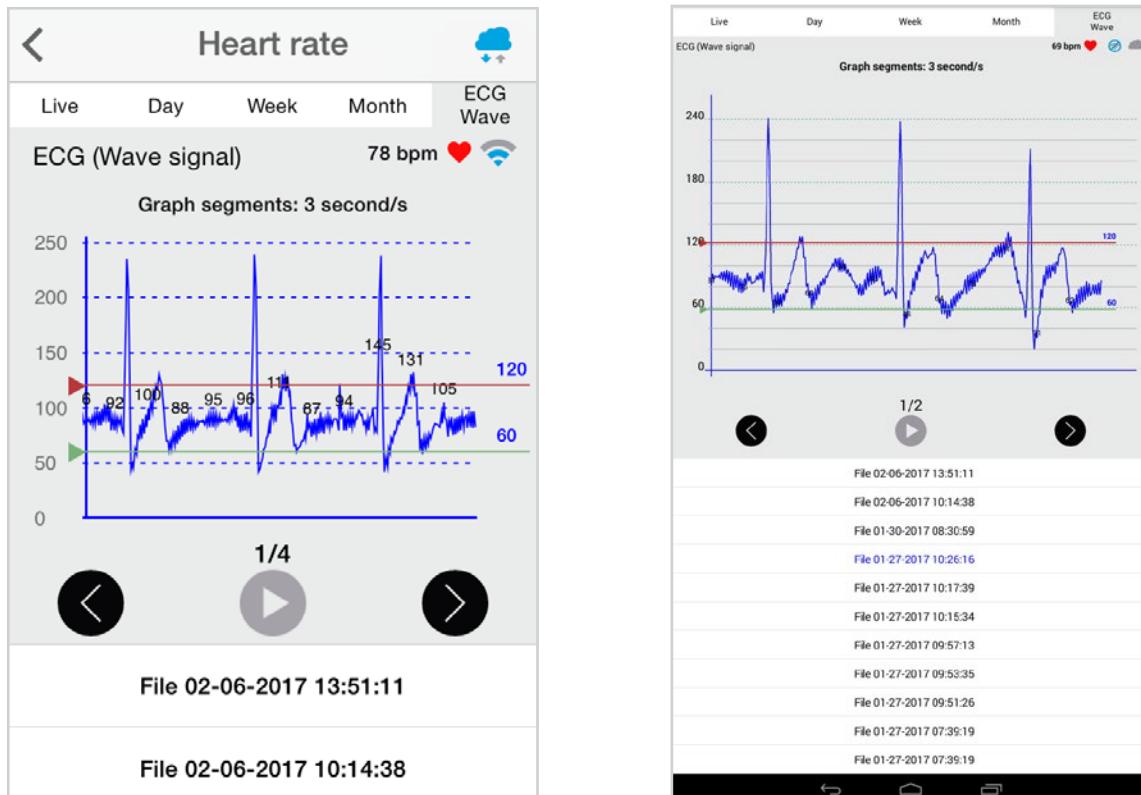


Figure: Detail mode

There is a new tab on detail screen for ECG, EMG, Airflow and Snore sensors. This tab allows the user to display raw data recorded from MySignals device (in Server Mode). You can record until 30 seconds from MySignals device and show the recorded data on raw data tab, this tab is placed on the top right of the screen.

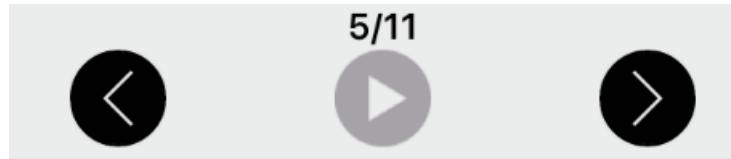
On top right, you can see the ECG rate, EMG rate, Airflow rate or Snore rate. Above the graph, you can see the graph time for X axis, in this case the graph was divided in windows of parts of 3 seconds each.



Over the graph you can notice the values for each important data peak, you can track wave changes by watching these values.

You can move the limits of the graph with the green and red lines, touch each line to move it along the graph view.

On bottom section from the graph view there are three buttons:



Right and left arrow buttons let you move the graph to right or left. In the middle position, there is a play/pause button to start or stop the carousel mode. By default and once the graph load ends, the graph animation plays automatically. For instance, if you record 30 seconds on MySignals device, the Application will show 11 parts to navigate using the left/right arrow buttons. Once the graph ends loading, the animation will play automatically.

Just above the play/pause button, you can see a little navigation legend to know which part of the full graph you are showing.

At the end of the screen you can get the list of MySignals recordings provided by the user from the device, this listing is shown in order from latest to oldest one, each row shows the recording date and time. Tap on one row to select a single recording and the mobile Application will start plotting the data on the graph, the row will be also highlighted to let the user know which row is currently plotting.

The listing rows have a sampling rate and it is about 10 milliseconds.

## MySignals Web Server

This is an example of sensor viewing in MySignals Web Server Mode.

First of all choose the sensor that you want to visualize. You can use the fast menu situated in the left side of the Web Server. Choose an user.

Member	DB records (%)	DB records	Action
Adeline Ulrich	0	0	
Amelia Nicolas	0	0	
Bonnie McGlynn	0	0	
Clifton Marks	0	0	
Danyi Harvey	0	0	
Jacomine Auflemer	0	0	
Jonathon Warsica	0	0	
Kelly Schmitz	0	0	
Kyle Mante	0	0	
Laisha Hertz	0	0	
Lourdes Gusikowski	0	0	
Novella Bedreier	0	0	
Oliver Christiansen	0	0	
Rossie Wolf	0	0	
Sasha Zbenicak	0	0	

Figure: Select user

You can select an upload to the cloud time interval in WiFi setting of 10, 20, 30 or 60 seconds.

Then you can see the General Sensor page. MySignals Web Server will monitor all the parameters in General Mode where it only show numeric values.

You can see in this screen a color code in the sensor logos:

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previously connection of some time ago.
- Grey: It is that the sensor is not connected.

The screenshot shows the MySignals web interface in General mode. On the left, a sidebar lists organizational units: CARDIOLOGY, DERMATOLOGY, TRAUMATOLOGY, DEVICES, and MEMBERS. Under MEMBERS, there are profiles for Anna Gethold, Brady Kales, Jody Goldner, Lauren Konope, and Shana Turcott. The main content area is titled 'Member' and shows details for Anna Gethold: Name (Anna), Surname (Gernert), Member ID (25), Last update (not specified), Height (173 cm), Weight (104 kg), Birthdate (10 Jun 1987), and Department (Dermatology). Below this is a 'Data' section with a list of sensors:

- Body position
- Temperature (Normal measure: 30 - 38 °C)
- Muscle contraction (cpm) (Normal measure: 0 - 10 cpm)
- Heart rate(bpm) (Normal measure: 60 - 120 bpm)
- Respiratory rate (ppm) (Normal measure: 12 - 25 ppm)
- Conductance (Normal measure: 1 - 7 µS)
- Diastolic pressure Systolic pressure (Normal measure: 40 - 80 mmHg 80 - 120 mmHg)
- Oxygen saturation (Normal measure: 95 - 98 %)
- Glucose mg (Normal measure: 72 - 114 mg/dl)
- PEF FEVI (Normal measure: 540 - 780 l/min 180 - 300 l)
- Snore rate (spm) (Normal measure: 10 - 25 spm)
- Weight (Normal measure: 40 - 120 kg)
- Diastolic pressure Systolic pressure (Normal measure: 40 - 80 mmHg 80 - 120 mmHg)
- Oxygen saturation (Normal measure: 95 - 98 %)
- Glucose (Normal measure: 72 - 114 mg/dl)
- EEG Attention EEG Meditation (Normal measure: 30 - 50 %)

Figure: General mode Web Server

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

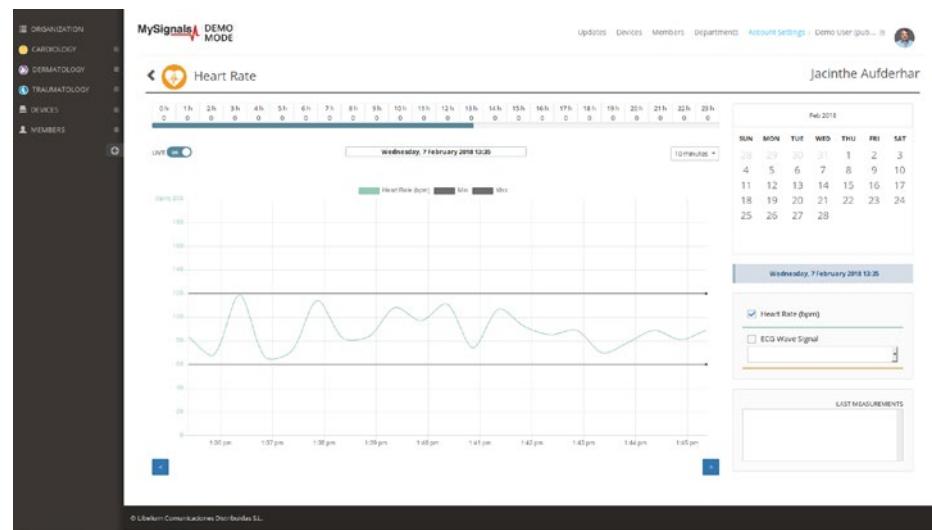


Figure: Detail mode Web Server

You can change the interval that configure MySignals to send data to the server. Introduce the value in seconds. MySignals will send data to the server as it is configured.

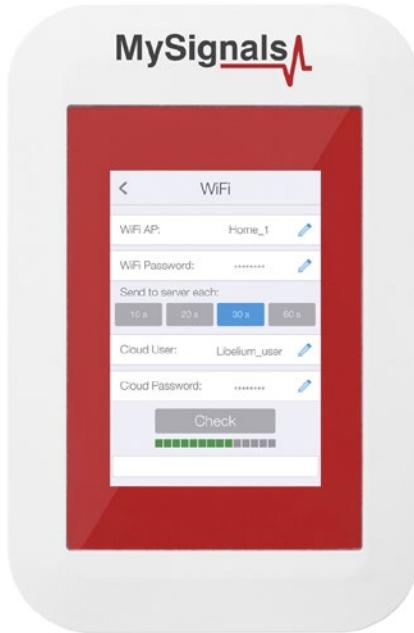


Figure: WiFi settings

## Raw data viewer

A new feature has been added allowing us to see the raw data, also known as wave signal, for the sensors: Airflow, ECG, EMG and Snore.

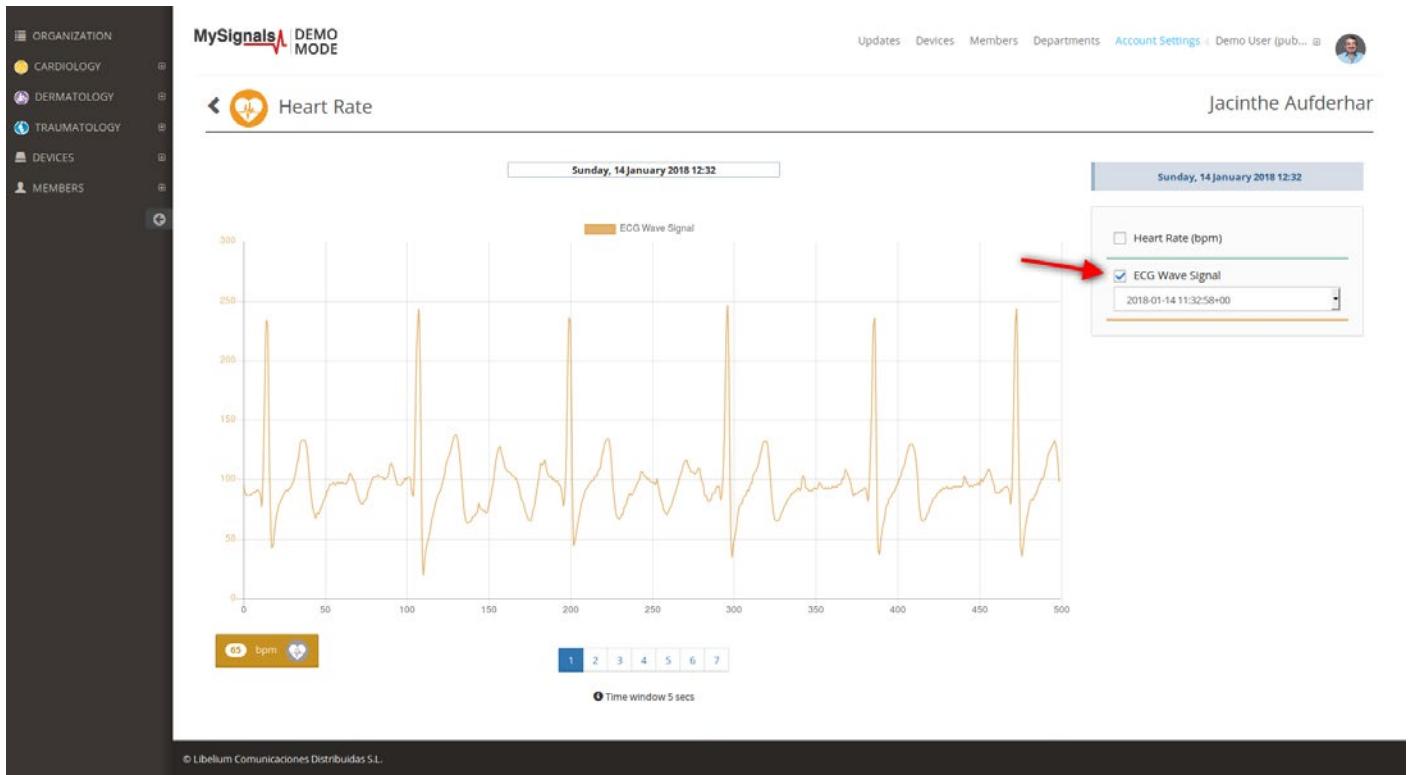
The screenshot shows the MySignals member detail page for a user named Esta Hane. The left sidebar includes sections for Organization, Cardiology (selected), Dermatology, Traumatology, Devices, and Members. The main content area is titled 'Member' and shows Esta's profile picture and basic information: Name: Esta, Surname: Hane, Member ID: 5, Last update: 2017-02-06 06:51:22-05:00. Below this is the 'Data' section, which lists various sensor readings with their normal ranges and a 'View' link. Red arrows point to the icons for Heart rate (bpm), Muscle contraction (cpm), Respiratory rate (ppm), and Snore rate (spm).

Sensor	Value	Normal Measure	Action
Body position	non-defined position		>
Temperature	25.73 °C	Normal measure: 36 - 38 °C	>
Muscle contraction	0 cpm	Normal measure: 0 - 10 cpm	>
Heart rate	106 bpm	Normal measure: 60 - 120 bpm	>
Respiratory rate	0 ppm	Normal measure: 12 - 25 ppm	>
Conductance	2764.87 µS	Normal measure: 2 - 7 µS	>
Diastolic pressure	Systolic pressure	Normal measure: 40 - 80 mmHg    80 - 120 mmHg	>
Oxygen saturation		Normal measure: 95 - 98 %	>
Glucose mg		Normal measure: 72 - 114 mg/dl	>
PEF	FEV1	Normal measure: 540 - 780 l/min    180 - 300 l	>
Snore rate	(spm)	Normal measure: 12 - 25 spm	>
Weight		Normal measure: 40 - 120 Kg	>
Diastolic pressure	Systolic pressure	Normal measure: 40 - 80 mmHg    80 - 120 mmHg	>
Oxygen saturation		Normal measure: 95 - 98 %	>
Glucose		Normal measure: 72 - 144 mg/dl	>
EEG Attention	EEG Meditation	Normal measure: 30 - 50 %    30 - 50 %	>

The member detail page shows a general view of the last values received for the different sensors.

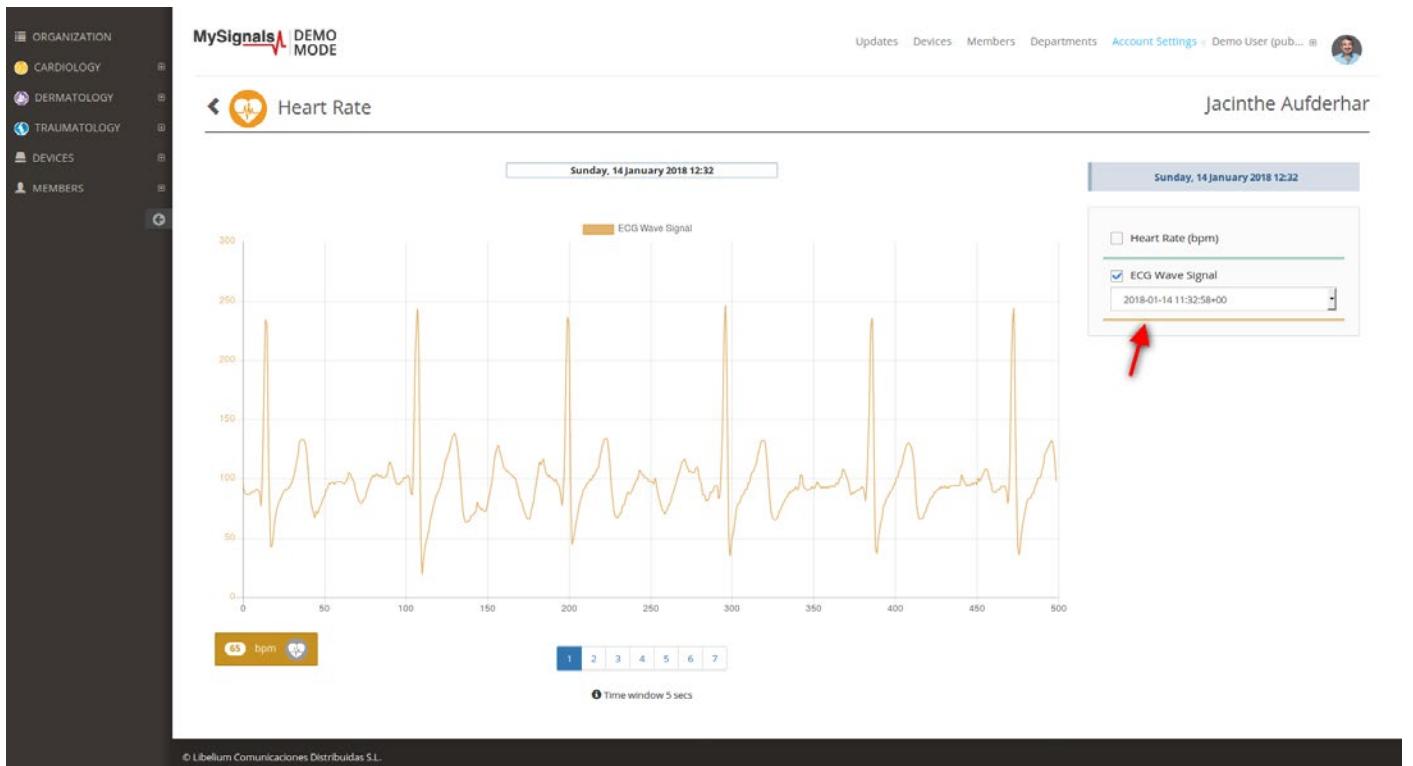
Please select one of the following sensors in order to go to the sensor detail page:

- Airflow: (Respiratory rate)
- ECG: (Heart rate)
- EMG: (Muscle contraction)
- Snore: (Snore rate)

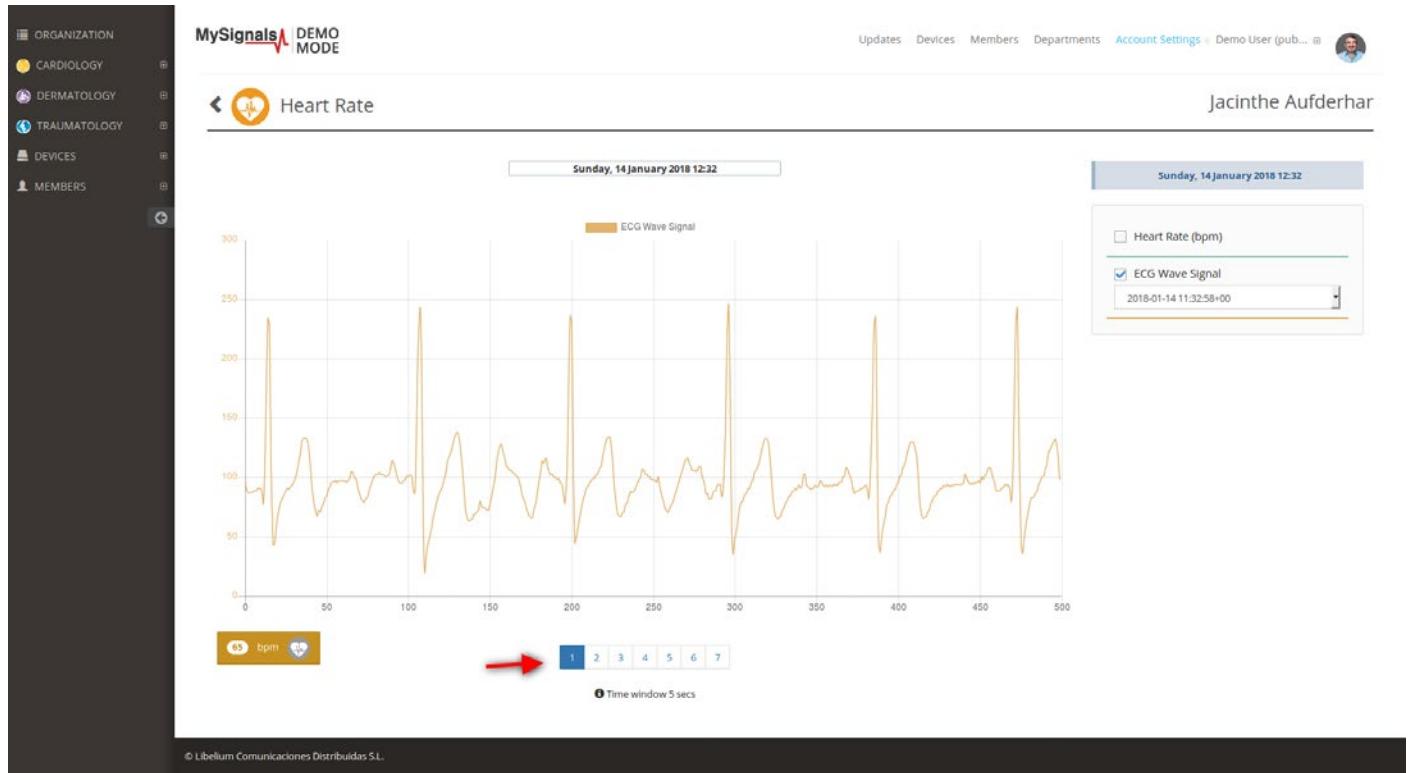


Once in this page click the 'Wave Signal' tab.

In the bottom right of the page there is a dropdown selector with the available raw values sorted by date. Select one of this an you will see the wave that was recorded using the MySignals hardware.



In the bottom center there is a pagination control that you can use for navigating the wave, going ahead and backwards in the timeline.



In the bottom left part of the page it's displayed the average value for bpm, ppm, cpm or spm for the entire period of the wave recorded.



### 7.1.3. Airflow

Anormal respiratory rates and changes in respiratory rate are a broad indicator of major physiological instability, and in many cases, respiratory rate is one of the earliest indicators of this instability. Therefore, it is critical to monitor respiratory rate as an indicator of patient status. AirFlow sensor can provide an early warning of hypoxemia and apnea.

#### 7.1.3.1. Sensor features

Description: The nasal / mouth airflow sensor is a device used to measure the breathing rate in a patient in need of respiratory help or person. This device consists of a flexible thread which fits behind the ears, and a set of two prongs which are placed in the nostrils. Breathing is measured by these prongs.

The specifically designed cannula/holder allows the thermocouple sensor to be placed in the optimal position to accurately sense the oral/nasal thermal airflow changes as well as the nasal temperature air. Comfortable adjustable and easy to install.



Figure: Airflow Sensor

The sensor needs to be connected to the specific Airflow jack connector in MySignals board and it works with direct connector power supply.

#### Measurement:

Parameter	Unit	Range
Respiratory rate	PPM (Peaks per minute)	0-60 ppm
Breathing intensity	Volts	0-3,3V

### 7.1.3.2. Connecting the sensor

Connect the sensor in the Airflow connector indicated in the MySignals Hardware board. The sensor cable include 2 pieces and it have only one way of connection to prevent errors and make the connection easier.



Figure: MySignals Hardware Development Platform with Airflow connected

The sensor integrate an extension cable with a "keyhole" connector. This middle connector have specific position in order to have the correct polarity. Please check the marks includes in the side of both connectors.



Figure: 2 pieces polarity Airflow cable

Place the sensor as shown below.

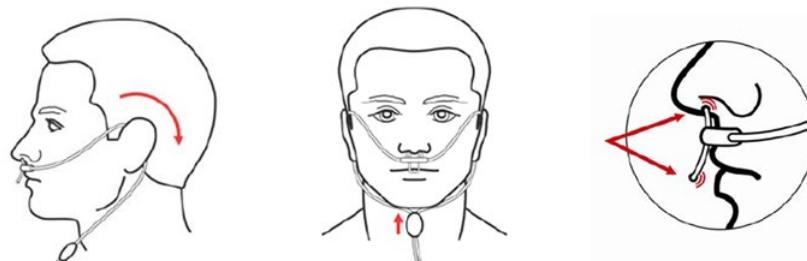
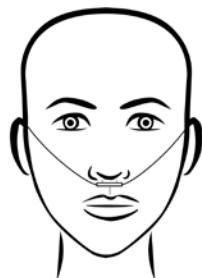


Figure: Airflow position diagram



*MySignals Hardware Development Platform with Airflow situated in the user body*

After a few seconds you will get the values in the visualization method programmed.

**NOTE:** Position the sensor in the correct position as you can see in the diagram connection, and wait 3-5 minutos in order to stabilize the sensor measure.

## 7.1.3.3. Examples of use

### Standalone Mode

This is an example of sensor measuring in Standalone Mode.

First of all select the sensor that you want to measure in the Select Sensors screen. Use the touchscreen pressing in the correct symbol. You can see the selected sensors logos in blue color.



Figure: Selected sensor logo

Then you can go to General Sensor screen using the left down corner logo. MySignals will start to monitor all the parameters in General Mode where it only show numeric values.



Figure: General mode and selecting general mode

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

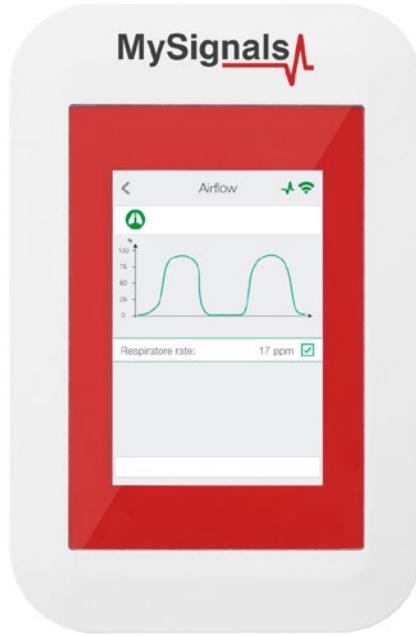


Figure: Detail mode

In September 2017 we have released new Firmware, Apps and Cloud versions that allow to record continuous waves and send them to record continuous waves and send them to the Cloud (in Server Mode). You can record 15 or 30 seconds of the data measured in detail mode of **ECG**, **EMG**, **Snore** and **Airflow**.



You can use this new function in Server Mode using detail mode. Use the **Record 15 seconds** or **Record 30 seconds** buttons in order to start a new record.

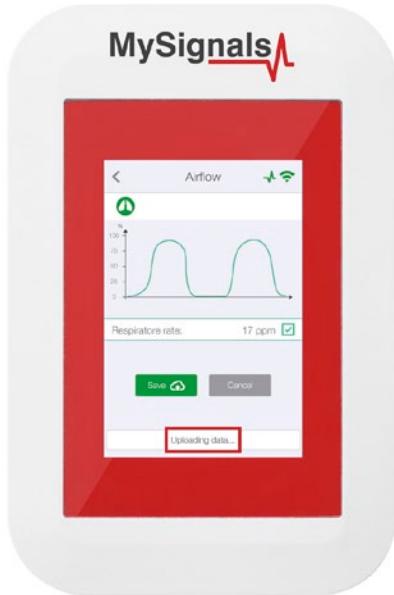
Note that you must use **View 15 seconds** or **View 30 seconds** buttons each time you want to see the wave in the screen.



With the record finished you can choose between saving this record in the cloud or cancel it.



You will see all the information about the upload to the cloud at the bottom of the screen (text message zone).



After a correct upload you will see the date of the file saved. Then you can see this new raw data file in the Web Server or in the Mobile App.



## MySignals App

This is an example of sensor viewing in MySignals App Mode.

First of all select the sensor that you want to measure in the Select Sensors screen. Use your smartphone touchscreen pressing in the correct simbol. You can see the selected sensors logos in blue color.



Figure: Selected sensor logo App

Then you can go to General Sensor screen using the left down corner logo. MySignals will start to monitor all the parameters in General Mode where it only show numeric values.

You can see in this screen a color code in the sensor logos:

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previously connection of some time ago.
- Grey: It is that the sensor is not connected.

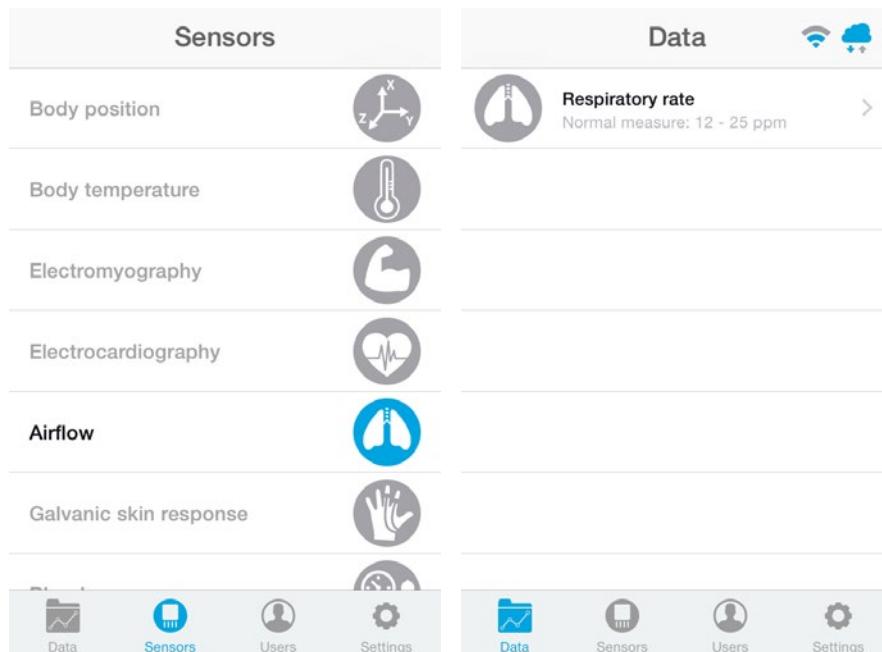


Figure: General mode and selecting general mode App

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

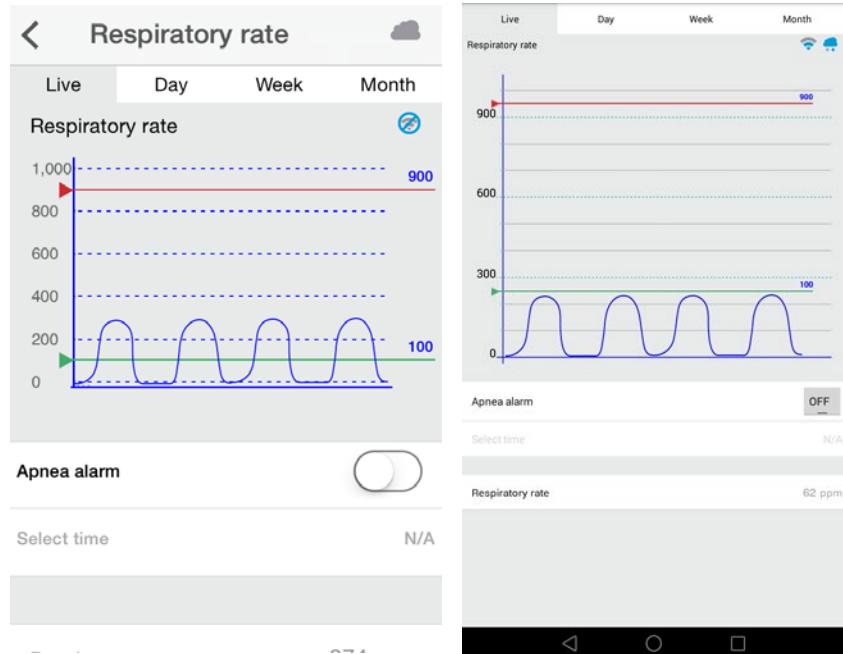
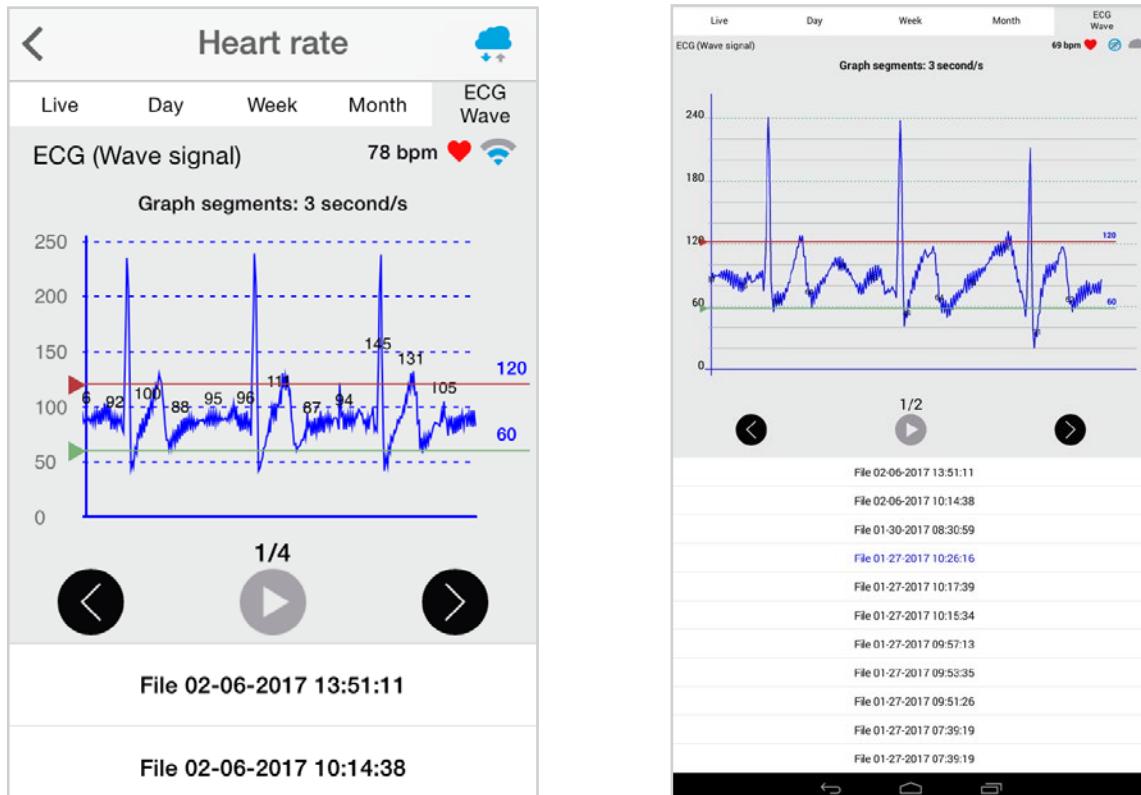


Figure: Detail mode

There is a new tab on detail screen for ECG, EMG, Airflow and Snore sensors. This tab allows the user to display raw data recorded from MySignals device (in Server Mode). You can record until 30 seconds from MySignals device and show the recorded data on raw data tab, this tab is placed on the top right of the screen.

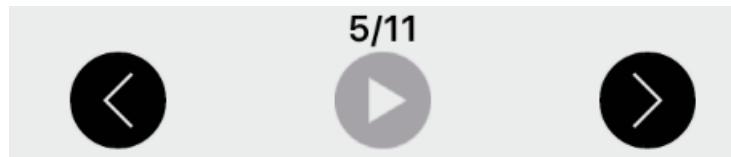
On top right, you can see the ECG rate, EMG rate, Airflow rate or Snore rate. Above the graph, you can see the graph time for X axis, in this case the graph was divided in windows of parts of 3 seconds each.



Over the graph you can notice the values for each important data peak, you can track wave changes by watching these values.

You can move the limits of the graph with the green and red lines, touch each line to move it along the graph view.

On bottom section from the graph view there are three buttons:



Right and left arrow buttons let you move the graph to right or left. In the middle position, there is a play/pause button to start or stop the carousel mode. By default and once the graph load ends, the graph animation plays automatically. For instance, if you record 30 seconds on MySignals device, the Application will show 11 parts to navigate using the left/right arrow buttons. Once the graph ends loading, the animation will play automatically.

Just above the play/pause button, you can see a little navigation legend to know which part of the full graph you are showing.

At the end of the screen you can get the list of MySignals recordings provided by the user from the device, this listing is shown in order from latest to oldest one, each row shows the recording date and time. Tap on one row to select a single recording and the mobile Application will start plotting the data on the graph, the row will be also highlighted to let the user know which row is currently plotting.

The listing rows have a sampling rate and it is about 10 milliseconds.

## MySignals Web Server

This is an example of sensor viewing in MySignals Web Server Mode.

First of all choose the sensor that you want to visualize. You can use the fast menu situated in the left side of the Web Server. Choose an user.

The screenshot shows the 'Account Settings' page of the MySignals Web Server. On the left, a sidebar lists organizational categories: ORGANIZATION, CARDIOLOGY, DERMATOLOGY, TRAUMATOLOGY, DEVICES, and MEMBERS. The main content area has tabs for 'Updates', 'Devices', 'Members', 'Departments', and 'Account Settings'. The 'Account Settings' tab is active. It displays the following information:

Name:	Demo User (public)	Sign up:	2018-02-07 08:53:06
Email:	*****@*****.com	Last update:	2018-02-07 08:56:17
<b>Usage</b>		<b>Statistics</b>	
Licence Usage Time	2018-02-07 08:56:17	Devices	5 / 1
Database Storage	0 of 500000	Members	15 / 5
API Calls	Your license has not API Cloud access * License expire on: 2019/01/07	Departments	3 / 1

Below this is a section titled 'Usage by Member' with a table:

Member	DB records (%)	DB records	Action
Adeline Ulrich	0	0	
Amelie Nicolas	0	0	
Burnice McGlynn	0	0	
Clifton Marks	0	0	
Daryl Harvey	0	0	
Jacinthe Auferhar	0	0	
Jonathon Watsica	0	0	
Kelly Schmitt	0	0	
Kyle Mante	0	0	
Laiska Hintz	0	0	
Lourdes Gusikowski	0	0	
Novella Bechtelar	0	0	
Oliver Christiansen	0	0	
Rossie Wolf	0	0	
Sasha Zboncak	0	0	

Figure: Select user

You can select an upload to the cloud time interval in WiFi setting of 10, 20, 30 or 60 seconds.

Then you can see the General Sensor page. MySignals Web Server will monitor all the parameters in General Mode where it only show numeric values.

You can see in this screen a color code in the sensor logos:

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previously connection of some time ago.
- Grey: It is that the sensor is not connected.

The screenshot shows the MySignals web interface. On the left, a sidebar lists organization categories like Cardiology, Dermatology, Traumatology, Devices, and Members. The main area is titled 'Member' and shows details for Anna Gerhold, including name, surname, member ID, height, weight, birthday, and department. Below this is a 'Data' section with a list of sensors and their normal ranges:

- Body position
- Temperature (Normal measure: 36 - 38 °C)
- Muscle contraction (cpm) (Normal measure: 0 - 10 cpm)
- Heart rate (bpm) (Normal measure: 60 - 120 bpm)
- Respiratory rate (ppm) (Normal measure: 12 - 30 ppm)
- Conductance (Normal measure: 2 - 7 µS)
- Diastolic pressure Systolic pressure (Normal measure: 40 - 80 mmHg / 80 - 120 mmHg)
- Oxygen saturation (Normal measure: 95 - 98 %)
- Glucose mg (Normal measure: 72 - 114 mg/dl)
- PEF FEV1 (Normal measure: 540 - 780 l/min / 180 - 300 l)
- Snore rate (spm) (Normal measure: 12 - 25 spm)
- Weight (Normal measure: 40 - 120 kg)
- Diastolic pressure Systolic pressure (Normal measure: 40 - 80 mmHg / 80 - 120 mmHg)
- Oxygen saturation (Normal measure: 95 - 98 %)
- Glucose (Normal measure: 72 - 144 mg/dl)
- EEG Attention EEG Meditation (Normal measure: 30 - 50 Hz / 20 - 30 Hz)

Figure: General mode Web Server

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.



Figure: Detail mode Web Server

You can change the interval that configure MySignals to send data to the server. Introduce the value in seconds. MySignals will send data to the server as it is configured.

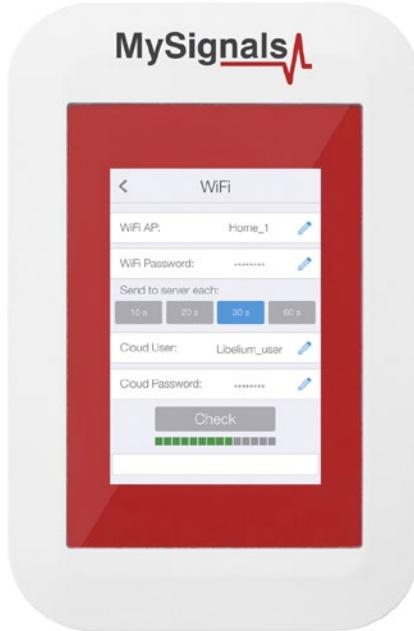


Figure: WiFi settings

## Raw data viewer

A new feature has been added allowing us to see the raw data, also known as wave signal, for the sensors: Airflow, ECG, EMG and Snore.

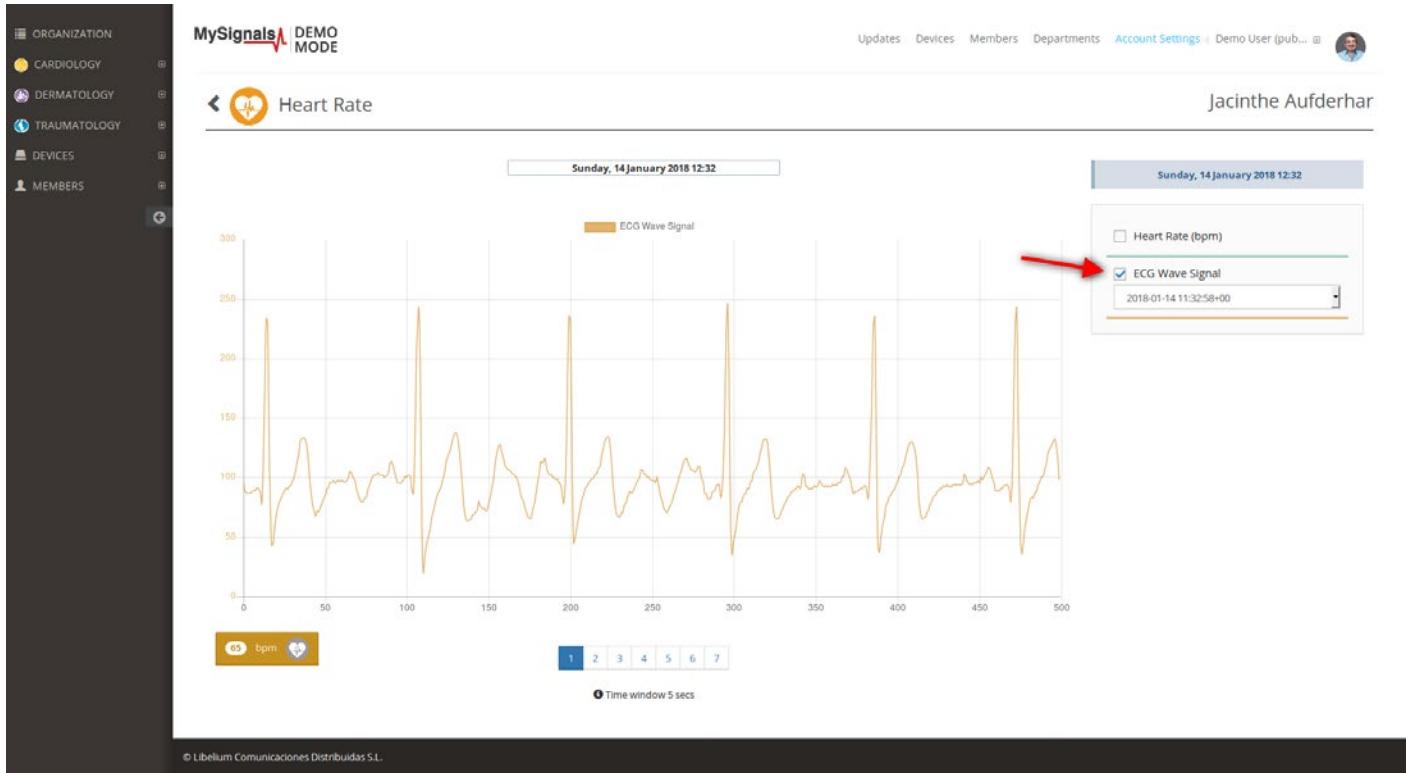
The screenshot shows the MySignals member detail page for a user named Esta Hane. The left sidebar includes sections for Organization, Cardiology (selected), Dermatology, Traumatology, Devices, and Members. The main content area is titled 'Member' and shows Esta's profile picture and basic information: Name: Esta, Surname: Hane, Member ID: 5, Last update: 2017-02-06 06:51:22-05:00. Below this is the 'Data' section, which lists various sensor readings with their normal ranges and a 'View' link. Red arrows point to the icons for Heart rate (bpm), Muscle contraction (cpm), Respiratory rate (ppm), and Snore rate (spm).

Sensor	Value	Normal Measure	Action
Body position	non-defined position		>
Temperature	25.73 °C	Normal measure: 36 - 38 °C	>
Muscle contraction	0 cpm	Normal measure: 0 - 10 cpm	>
Heart rate	106 bpm	Normal measure: 60 - 120 bpm	>
Respiratory rate	0 ppm	Normal measure: 12 - 25 ppm	>
Conductance	2764.87 µS	Normal measure: 2 - 7 µS	>
Diastolic pressure	Systolic pressure	Normal measure: 40 - 80 mmHg    80 - 120 mmHg	>
Oxygen saturation		Normal measure: 95 - 98 %	>
Glucose mg		Normal measure: 72 - 114 mg/dl	>
PEF	FEV1	Normal measure: 540 - 780 l/min    180 - 300 l	>
Snore rate	(spm)	Normal measure: 12 - 25 spm	>
Weight		Normal measure: 40 - 120 Kg	>
Diastolic pressure	Systolic pressure	Normal measure: 40 - 80 mmHg    80 - 120 mmHg	>
Oxygen saturation		Normal measure: 95 - 98 %	>
Glucose		Normal measure: 72 - 144 mg/dl	>
EEG Attention	EEG Meditation	Normal measure: 30 - 50 %    30 - 50 %	>

The member detail page shows a general view of the last values received for the different sensors.

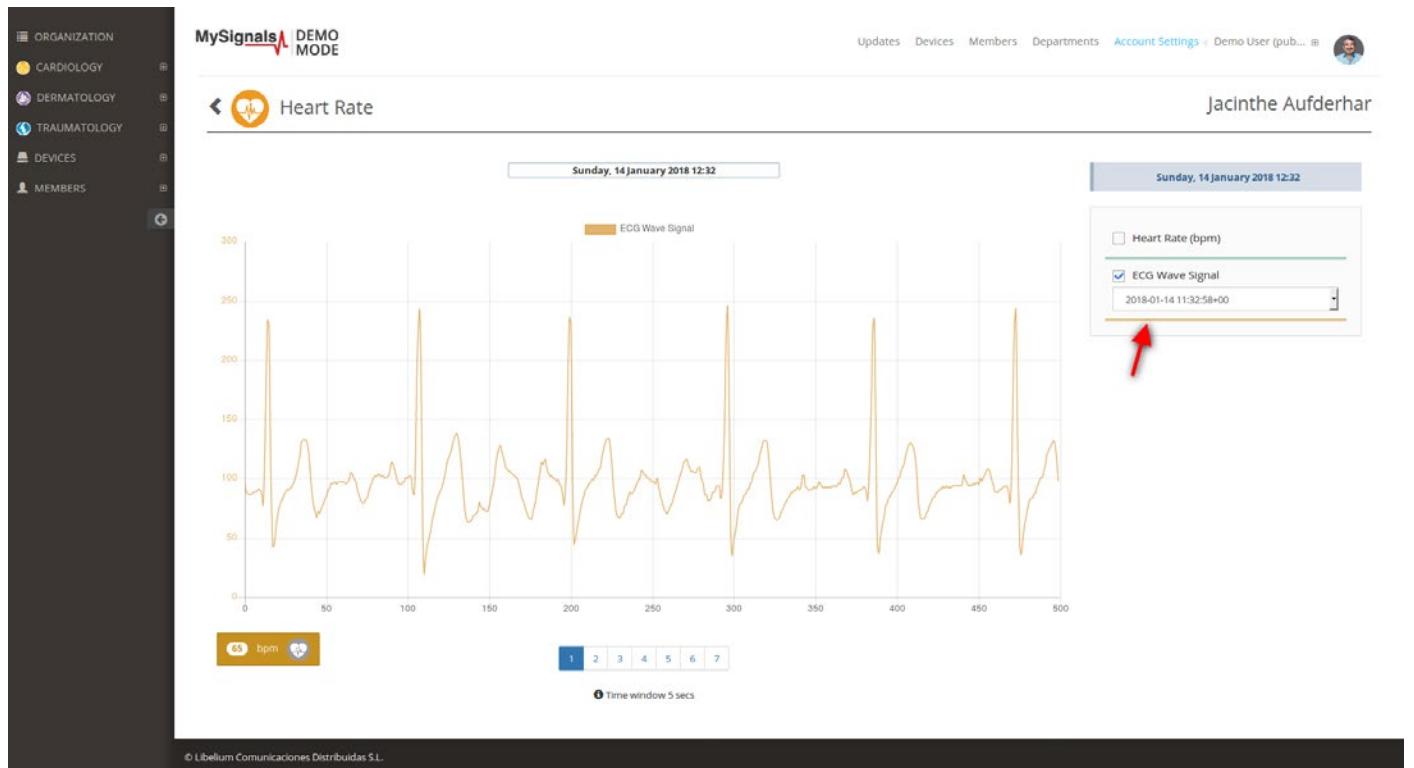
Please select one of the following sensors in order to go to the sensor detail page:

- Airflow: (Respiratory rate)
- ECG: (Heart rate)
- EMG: (Muscle contraction)
- Snore: (Snore rate)



Once in this page click the 'Wave Signal' tab.

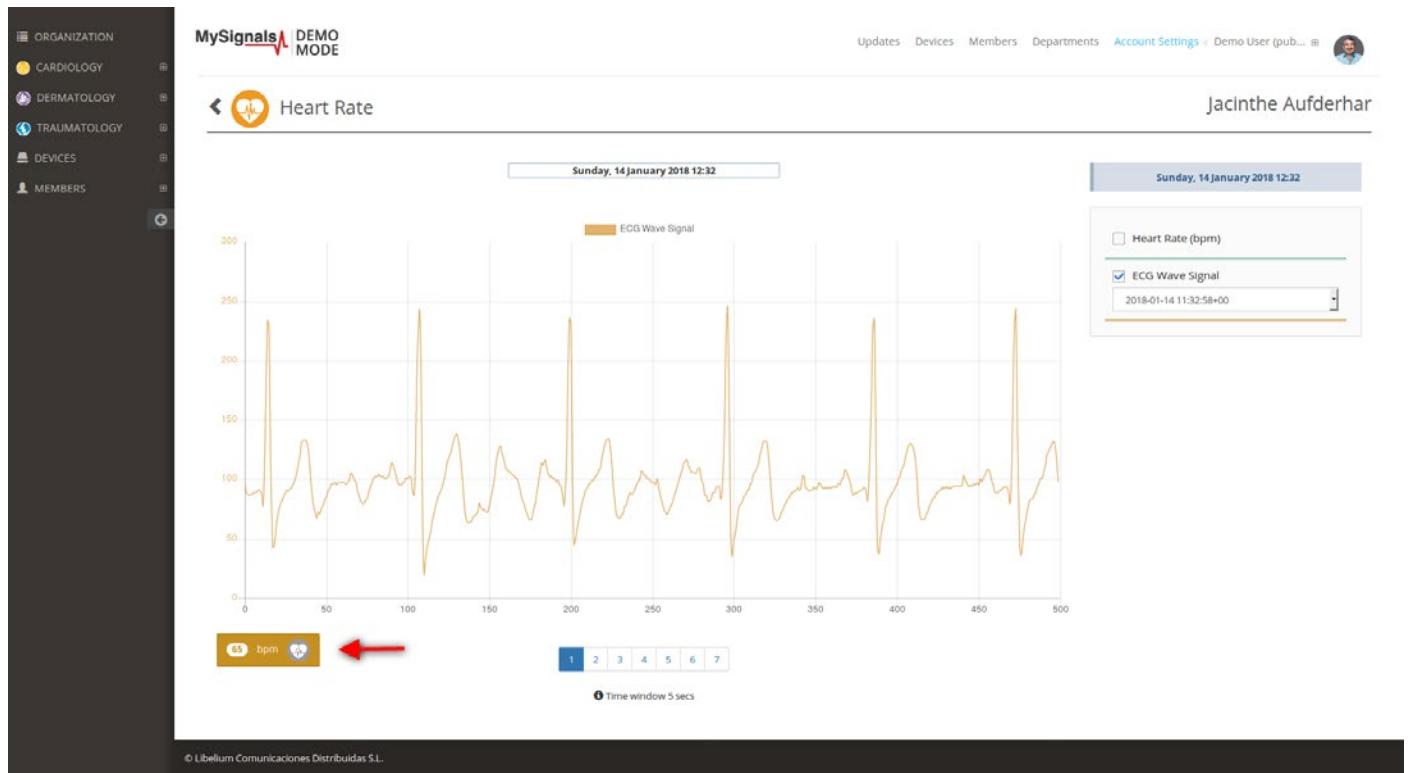
In the bottom right of the page there is a dropdown selector with the available raw values sorted by date. Select one of this an you will see the wave that was recorded using the MySignals hardware.



In the bottom center there is a pagination control that you can use for navigating the wave, going ahead and backwards in the timeline.



In the bottom left part of the page it's displayed the average value for bpm, ppm, cpm or spm for the entire period of the wave recorded.



## 7.1.4. Blood Pressure Monitor

Blood pressure is the pressure of the blood in the arteries as it is pumped around the body by the heart. When your heart beats, it contracts and pushes blood through the arteries to the rest of your body. This force creates pressure on the arteries. Blood pressure is recorded as two numbers—the systolic pressure (as the heart beats) over the diastolic pressure (as the heart relaxes between beats).

### 7.1.4.1. Sensor features

Description: Monitoring blood pressure at home is important for many people, especially if you have high blood pressure. Blood pressure does not stay the same all the time. It changes to meet your body's needs. It is affected by various factors including body position, breathing or emotional state, exercise and sleep. It is best to measure blood pressure when you are relaxed and sitting or lying down.



Figure: Blood Pressure sensor

#### Classification of blood pressure for adults (18 years and older)

	Systolic (mm Hg)	Diastolic (mm Hg)
<b>Hypotension</b>	< 90	< 60
<b>Desired</b>	90–119	60–79
<b>Prehypertension</b>	120–139	80–89
<b>Stage 1 Hypertension</b>	140–159	90–99
<b>Stage 2 Hypertension</b>	160–179	100–109
<b>Hypertensive Crisis</b>	≥ 180	≥ 110

High blood pressure (hypertension) can lead to serious problems like heart attack, stroke or kidney disease. High blood pressure usually does not have any symptoms, so you need to have your blood pressure checked regularly.

## SPECIAL FEATURES:

- Automatic measurement of systolic, diastolic and pulse
- 80 measurement results with time & date stored in the device

## KEY SPECIFICATIONS

- Measurement method: Oscillometric system
- Measuring range: Pressure 0-300 mmHg
- Pulse 30~200 p/min
- Measuring accuracy: Pressure  $\leq \pm 3$  mmHg
- Pulse  $\leq 5\%$
- Operating environment: Temperature 10 - 40°C
- Relative humidity  $\leq 80\%$

The sensor needs to be connected to the specific Blood Pressure Monitor jack connector in MySignals board and it works with internal rechargeable battery. Use the Blood pressure specific cable in order to charge the sensor connected to MySignals.



Figure: Blood Pressure sensor with charger cable connected

## Measurement:

Parameter	Unit	Range
Systolic pressure	mm Hg	0-300 mmHg
Diastolic pressure	mm Hg	0-300 mmHg
Pulse	ppm	30~200 ppm

### 7.1.4.2. Connecting the sensor

#### Connecting the sensor

Connect the sensor in the Blood Pressure connector indicated in the MySignals Hardware board. The sensor cable have only one way of connection to prevent errors and make the connection easier. Use the mini-USB connector to link the Blood Pressure monitor with the MySignals board, using the normal jack connector (3.5mm) of the cable in this side.

Before start using the sphygmomanometer we need to connect the sensor in MySignals board. After that we can get all the information contained in the device.



Figure: Cable connection Blood Pressure

Place the sphygmomanometer on your arm (biceps zone) as shown in the image below.

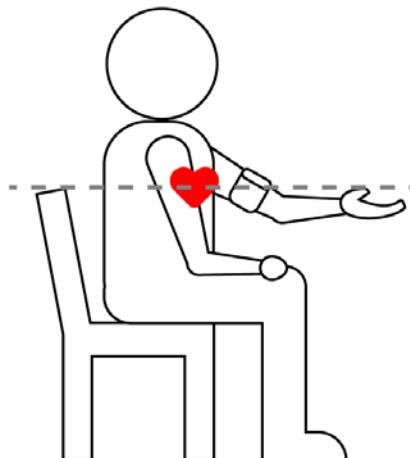


Figure: Blood Pressure connection diagram

Turn on the sphygmomanometer cuff (press ON button). The sensor will begin to make a measurement. In order to measure correctly is important to maintain the arm and the cuff in the correct position.



Figure: Blood Pressure sensor ON button

Do not make abrupt movements or the measure will be not reliable.

The sphygmomanometer will take a few moments to calculate the blood pressure reading.



Figure: MySignals Hardware Development Platform with Blood Pressure situated in the user body

After a few seconds you will get the values in the visualization method programmed.

## 7.1.4.3. Examples of use

### Standalone Mode

This is an example of sensor measuring in Standalone Mode.

First of all select the sensor that you want to measure in the Select Sensors screen. Use the touchscreen pressing in the correct simbol. You can see the selected sensors logos in blue color.



Figure: Selected sensor logo

Then you can go to General Sensor screen using the left down corner logo. MySignals will start to monitor all the parameters in General Mode where it only show numeric values.



Figure: General mode and selecting general mode

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.



Figure: Detail mode

## MySignals App

This is an example of sensor viewing in MySignals App Mode.

First of all select the sensor that you want to measure in the Select Sensors screen. Use your smartphone touchscreen pressing in the correct simbol. You can see the selected sensors logos in blue color.



Figure: Selected sensor logo App

Then you can go to General Sensor screen using the left down corner logo. MySignals will start to monitor all the parameters in General Mode where it only show numeric values.

You can see in this screen a color code in the sensor logos:

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previously connection of some time ago.
- Grey: It is that the sensor is not connected.

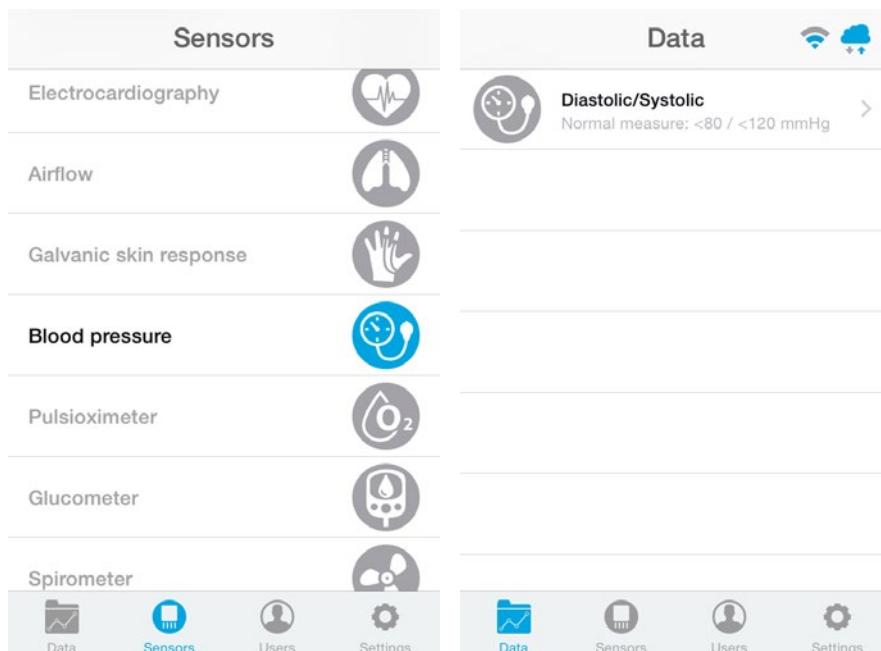


Figure: General mode and selecting general mode App

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

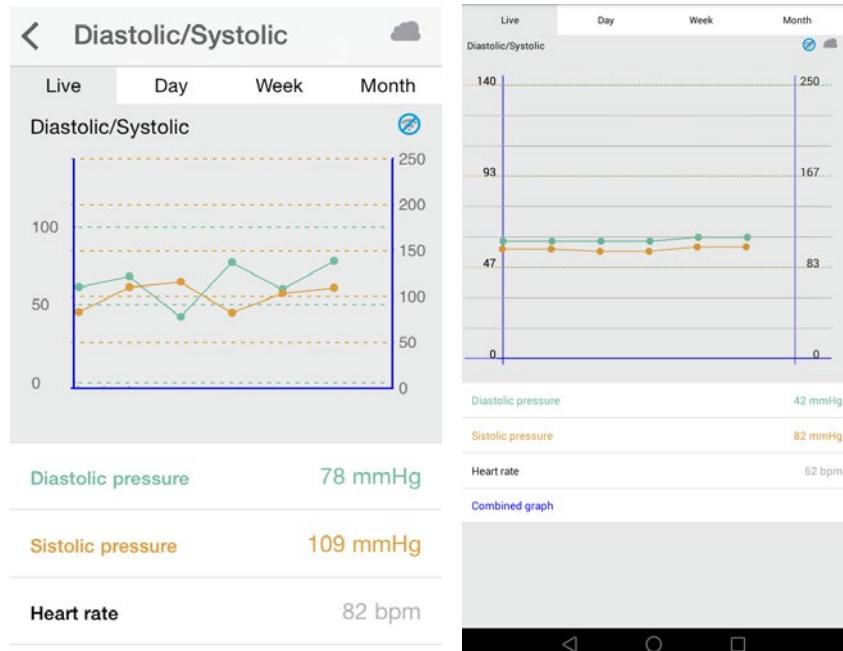


Figure: Detail mode

In detail mode of blood pressure sensor and blood pressure BLE sensor, you can use the measure interval of time in order to configure the time between each measure. '0' indicates that MySignals powers off the sensor after each measurement.



Figure: Blood pressure sensors detail view

## MySignals Web Server

This is an example of sensor viewing in MySignals Web Server Mode.

First of all choose the sensor that you want to visualize. You can use the fast menu situated in the left side of the Web Server. Choose an user.

Category	Value
Name:	Demo User (public)
Email:	*****@*****.*****
Sign up:	2018-02-07 08:53:06
Last update:	2018-02-07 08:56:17

Category	Value
Devices	5 / 1
Members	15 / 5
Departments	3 / 1

Member	DB records (%)	DB records	Action
Adeline Ulrich	0	0	
Amelie Nicolas	0	0	
Burnice McGlynn	0	0	
Clifton Marks	0	0	
Daryl Harvey	0	0	
Jacintine Aufderhar	0	0	
Jonathon Watsica	0	0	
Kelly Schmitt	0	0	
Kyle Mante	0	0	
Lainha Hintz	0	0	
Lourdes Guslowski	0	0	
Novella Bechtelar	0	0	
Oliver Christiansen	0	0	
Rossie Wolf	0	0	
Sasha Zboricak	0	0	

Figure: Select user

You can select an upload to the cloud time interval in WiFi setting of 10, 20, 30 or 60 seconds.

Then you can see the General Sensor page. MySignals Web Server will monitor all the parameters in General Mode where it only show numeric values.

You can see in this screen a color code in the sensor logos:

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previously connection of some time ago.
- Grey: It is that the sensor is not connected.

The screenshot shows the MySignals web interface in General mode. On the left is a dark sidebar with navigation links: ORGANIZATION, CARDIOLOGY, DERMATOLOGY, TRAUMATOLOGY, DEVICES, and MEMBERS. The main area has a header "MySignals" with a red heart icon and a user profile. Below the header are tabs for Devices, Members, Departments, Account Setting, and Demo User (with a profile picture). A "Member" section displays a photo of Anna Gerhold and her details: Name: Anna, Surname: Gerhold, Member ID: 29, Height: 173 cm, Weight: 104 kg, Birthday: 10 Jun 1987, and Department: Dermatology. A "Data" section lists various sensors with their normal ranges:

- Body position
- Temperature (Normal measure: 36 - 38 °C)
- Muscle contraction (cpm) (Normal measure: 0 - 10 cpm)
- Heart rate (bpm) (Normal measure: 60 - 120 bpm)
- Respiratory rate (ppm) (Normal measure: 12 - 25 ppm)
- Conductance (Normal measure: 2 - 7 µS)
- Diastolic pressure Systolic pressure (Normal measure: 40 - 80 mmHg | 80 - 120 mmHg)
- Oxygen saturation (Normal measure: 90 - 98 %)
- Glucose mg (Normal measure: 72 - 114 mg/dL)
- PEF FEV1 (Normal measure: 540 - 780 L/min | 180 - 300 L)
- Snore rate (spm) (Normal measure: 12 - 25 spm)
- Weight (Normal measure: 40 - 120 Kg)
- Diastolic pressure Systolic pressure (Normal measure: 40 - 80 mmHg | 80 - 120 mmHg)
- Oxygen saturation (Normal measure: 95 - 98 %)
- Glucose (Normal measure: 72 - 144 mg/dL)
- EEG Attention EEG Meditation (Normal measure: 30 - 50 % | 30 - 50 %)

Figure: General mode Web Server

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

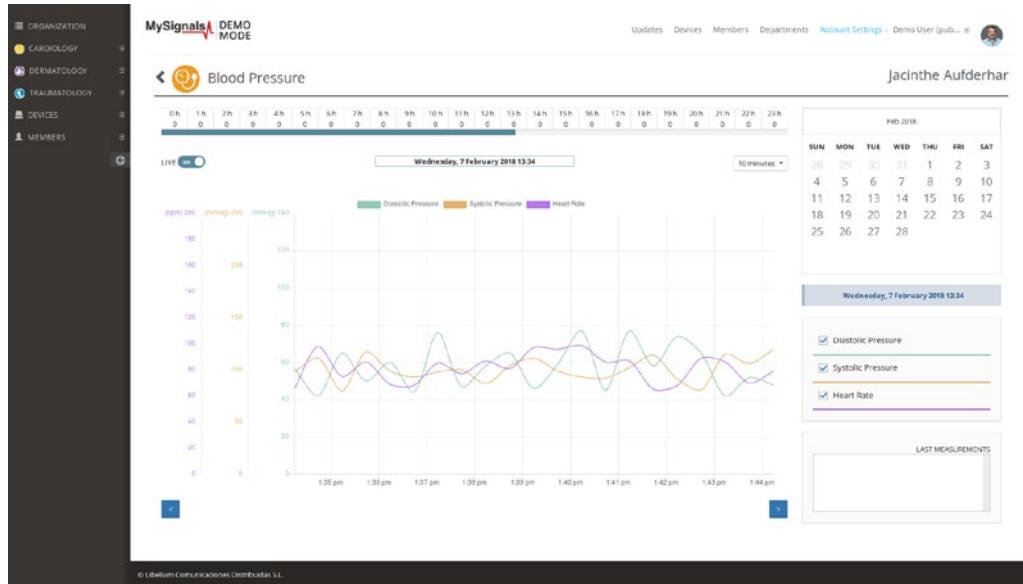


Figure: Detail mode Web Server

You can change the interval that configure MySignals to send data to the server. Introduce the value in seconds. MySignals will send data to the server as it is configured.

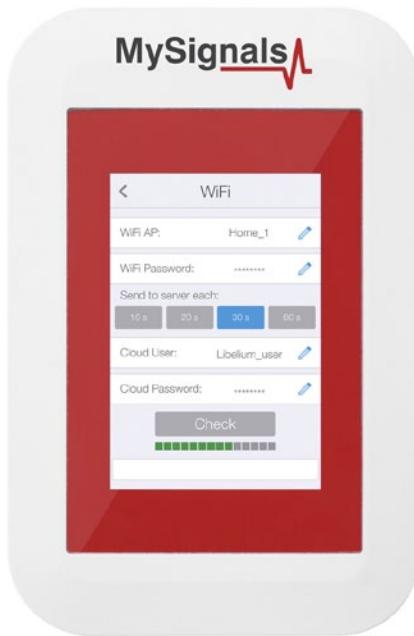


Figure: WiFi settings

## 7.1.5. Glucometer

Despite widely variable intervals between meals or the occasional consumption of meals with a substantial carbohydrate load, human blood glucose levels tend to remain within the normal range. However, shortly after eating, the blood glucose level may rise, in non-diabetics, temporarily up to 7.8 mmol/L (140 mg/dL) or a bit more.

### 7.1.5.1. Sensor features

Description: Glucometer is a medical device for determining the Approximate concentration of glucose in the blood. A small drop of blood, obtained by pricking the skin with a lancet, is placed on a disposable test strip that the meter reads and uses to calculate the blood glucose level. The meter then displays the level in mg/dl or mmol/l.



Figure: Glucometer sensor

This sensor uses 2 AAA batteries.

### 7.1.5.2. Connecting the sensor

Connect the sensor in the Glucometer connector indicated in the MySignals Hardware board. The sensor cable have only one way of connection to prevent errors and make the connection easier. Use the mini-jack connector (2.5mm) to link the Glucometer with the MySignals board, using the normal jack connector (3.5mm) of the cable in this side.

Before start using the glucometer we need one measure at least in the memory of the glucometer. After that we can get all the information contained in the glucometer (date, glucose value).



Figure: Insert strip in the glucometer.

Place a test strip in the machine when the machine is ready. Watch the indicator for placing the blood to the strip. Once the test strip package is opened, it must be consumed within 3 months.



Figure: Ready for measurement glucometer

Clean the end of your index finger with rubbing alcohol before pricking it with an sterile needle or lancet.

**NOTE:** The needles or lancets are not provided.



Figure: Lancet glucometer method 1

Pierce your finger tip on the soft, fleshy pad and obtain a drop of blood. The type of drop of blood is determined by the type of strip you are using



Figure: Lancet glucometer method 2

Place the drop of blood on or at the side of the strip.



Figure: Drop glucometer method 1



Figure: Drop glucometer method 2

The glucometer will take a few moments to calculate the blood sugar reading.



Figure: Glucometer measure

The glucometer will store the value in the memory.

In order to extract the data from the glucometer to the Arduino, connect the cable as show in the picture.



Figure: Cable connection

You should view in the glucometer screen the message "P-C", that indicates the correct connection.



Figure: PC indication glucometer

The maximum recommended number of measures stored in the glucometer is 5. Please delete all the measures after it using the glucometer button. (press it several times and then use the M button)



Figure: Configuration button in the glucometer

You can turn off the device holding the M button during 3 seconds.



Figure: Configuration button in the glucometer B

## Setting time

In order to use the date and time in each measure it is necessary to set correctly these parameters in the device.



Figure: MySignals Hardware Development Platform with Glucometer DATE

Set time information after inserting new batteries. Use the button allocated in the batteries backpack in order to initialize the configuration of these parameters.

## 7.1.5.3. Examples of use

### Standalone Mode

This is an example of sensor measuring in Standalone Mode.

First of all select the sensor that you want to measure in the Select Sensors screen. Use the touchscreen pressing in the correct simbol. You can see the selected sensors logos in blue color.



Figure: Selected sensor logo

Then you can go to General Sensor screen using the left down corner logo. MySignals will start to monitor all the parameters in General Mode where it only show numeric values.



Figure: General mode and selecting general mode

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.



Figure: Detail mode

## MySignals App

This is an example of sensor viewing in MySignals App Mode.

First of all select the sensor that you want to measure in the Select Sensors screen. Use your smartphone touchscreen pressing in the correct simbol. You can see the selected sensors logos in blue color.



Figure: Selected sensor logo App

Then you can go to General Sensor screen using the left down corner logo. MySignals will start to monitor all the parameters in General Mode where it only show numeric values.

You can see in this screen a color code in the sensor logos:

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previously connection of some time ago.
- Grey: It is that the sensor is not connected.

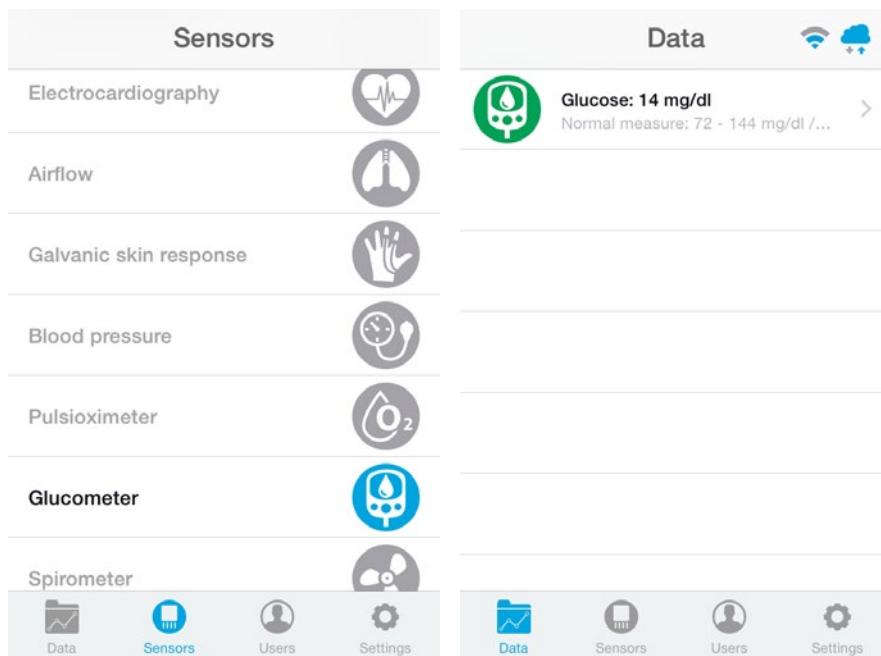


Figure: General mode and selecting general mode App

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

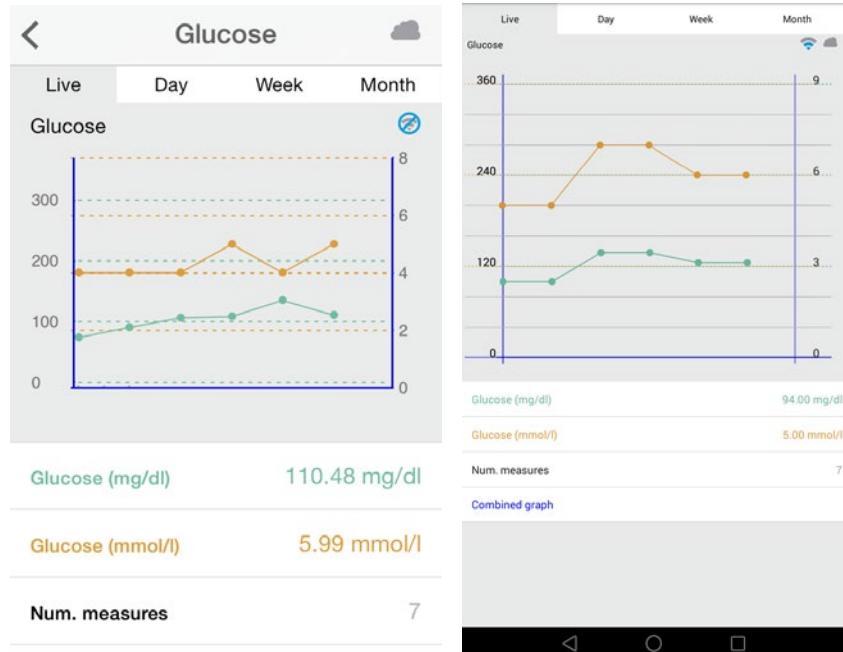


Figure: Detail mode

## MySignals Web Server

This is an example of sensor viewing in MySignals Web Server Mode.

First of all choose the sensor that you want to visualize. You can use the fast menu situated in the left side of the Web Server. Choose an user.

The screenshot shows the 'Account Settings' page of the MySignals Web Server. On the left, a sidebar lists categories: ORGANIZATION, CARDIOLOGY, DERMATOLOGY, TRAUMATOLOGY, DEVICES, and MEMBERS. The main content area has tabs for 'Updates', 'Devices', 'Members', 'Departments', and 'Account Settings'. The 'Account Settings' tab is active. It displays the following information:

Name:	Demo User (public)	Sign up:	2018-02-07 08:53:06
Email:	*****@*****.com	Last update:	2018-02-07 08:56:17
		<b>504</b>	

**Usage**

- Licence Usage Time: 2018-02-07
- Database Storage: 0 of 500000
- API Calls: Your license has not API Cloud access. \* License expire on: 2019/01/07

**Statistics**

Category	Value
Devices	5 / 1
Members	15 / 5
Departments	3 / 1

**Usage by Member**

Member	DB records (%)	DB records	Action
Adeline Ulrich	0%	0	<span>edit</span>
Amelie Nicolas	0%	0	<span>edit</span>
Burnice McGlynn	0%	0	<span>edit</span>
Clifton Marks	0%	0	<span>edit</span>
Daryl Harvey	0%	0	<span>edit</span>
Jacinthe Auferhar	0%	0	<span>edit</span>
Jonathon Watsica	0%	0	<span>edit</span>
Kelly Schmitt	0%	0	<span>edit</span>
Kyle Mante	0%	0	<span>edit</span>
Laiska Hintz	0%	0	<span>edit</span>
Lourdes Gusikowski	0%	0	<span>edit</span>
Novella Bechtelar	0%	0	<span>edit</span>
Oliver Christiansen	0%	0	<span>edit</span>
Rossie Wolf	0%	0	<span>edit</span>
Sasha Zboracik	0%	0	<span>edit</span>

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Figure: Select user

You can select an upload to the cloud time interval in WiFi setting of 10, 20, 30 or 60 seconds.

Then you can see the General Sensor page. MySignals Web Server will monitor all the parameters in General Mode where it only show numeric values.

You can see in this screen a color code in the sensor logos:

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previous connection of some time ago.
- Grey: It is that the sensor is not connected.

The screenshot shows the MySignals web interface. On the left, a sidebar lists organization categories like Cardiology, Dermatology, Traumatology, Devices, and Members. The main area is titled 'Member' and shows details for 'Anna Gerhold': Name (Anna), Surname (Gerhold), Member ID (25), Last update (10 Jun 2018), Height (173 cm), Weight (104 kg), Birthday (10 Jun 1987), and Department (Dermatology). Below this is a 'Data' section with a list of sensors and their normal ranges:

- Body position
- Temperature (Normal measure: 35 - 38 °C)
- Muscle contraction (cpm) (Normal measure: 0 - 10 cpm)
- Heart rate (bpm) (Normal measure: 60 - 120 bpm)
- Respiratory rate (ppm) (Normal measure: 12 - 25 ppm)
- Conductance
- Diastolic pressure - Systolic pressure (Normal measure: 40 - 80 mmHg - 80 - 120 mmHg)
- Oxygen saturation (Normal measure: 95 - 98 %)
- Glucose mg (Normal measure: 72 - 114 mg/dl)
- PEF - FEV1 (Normal measure: 540 - 780 l/min - 180 - 300 l)
- Snore rate (spm) (Normal measure: 12 - 25 spm)
- Weight (Normal measure: 40 - 120 kg)
- Diastolic pressure - Systolic pressure (Normal measure: 40 - 80 mmHg - 80 - 120 mmHg)
- Oxygen saturation (Normal measure: 95 - 98 %)
- Glucose (Normal measure: 72 - 144 mg/dl)
- EEG Attention - EEG Meditation (Normal measure: 30 - 50 % - 30 - 50 %)

Figure: General mode Web Server

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

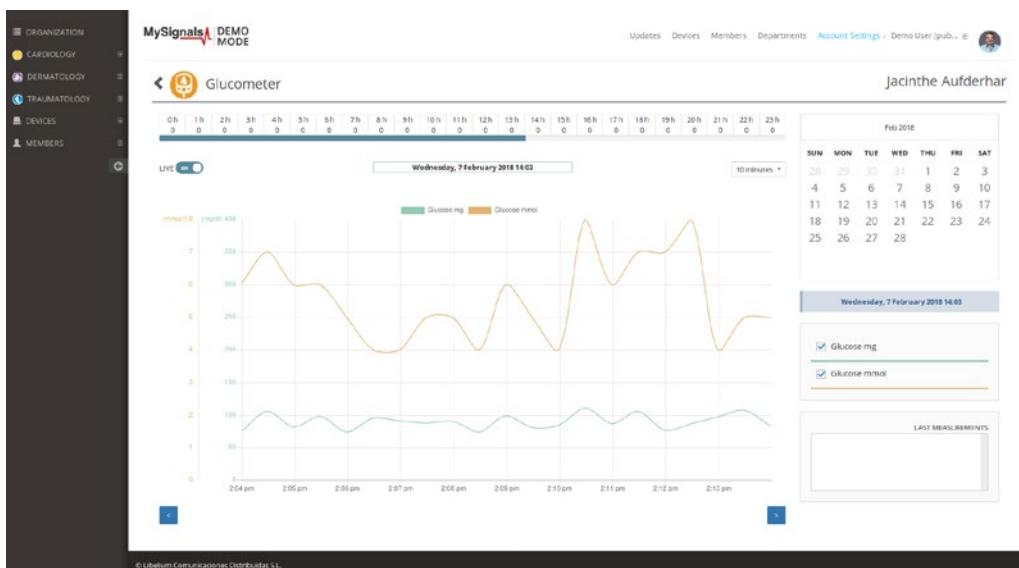


Figure: Detail mode Web Server

You can change the interval that configure MySignals to send data to the server. Introduce the value in seconds. MySignals will send data to the server as it is configured.

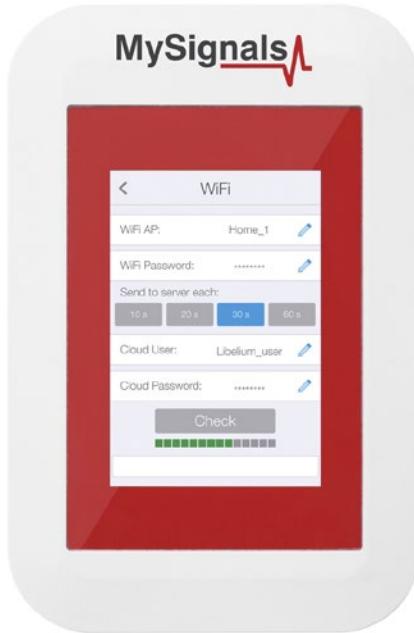


Figure: WiFi settings

## 7.1.6. Body Temperature

Body temperature depends upon the place in the body at which the measurement is made, and the time of day and level of activity of the person. Different parts of the body have different temperatures.

*The commonly accepted average core (taken internally) is 37.0°C (98.6°F). In healthy adults, body temperature fluctuates about 0.5°C (0.9°F) throughout the day, with lower temperatures in the morning and higher temperatures in the late afternoon and evening, as the body's needs and activities change.*

### 7.1.6.1. Sensor features

Description: Exacon D-S18JK sensor allows you to measure this key parameter for body monitoring.



Figure: Temperature Sensor

It is of great medical importance to measure body temperature. The reason is that a number of diseases are accompanied by characteristic changes in body temperature. Likewise, the course of certain diseases can be monitored by measuring body temperature, and the efficiency of a treatment initiated can be evaluated by the physician.

**Hypothermia** <35.0 °C (95.0 °F)

**Normal** 36.5–37.5 °C (97.7–99.5 °F)

**Fever or Hyperthermia** >37.5–38.3 °C (99.5–100.9 °F)

**Hyperpyrexia** >40.0–41.5 °C (104–106.7 °F)

The sensor needs to be connected to the specific Temperature jack connector in MySignals board and it works with direct connector power supply.

#### Measurement:

Parameter	Unit	Range
Body Temperature	Degree Celsius (°C)	0-50°C

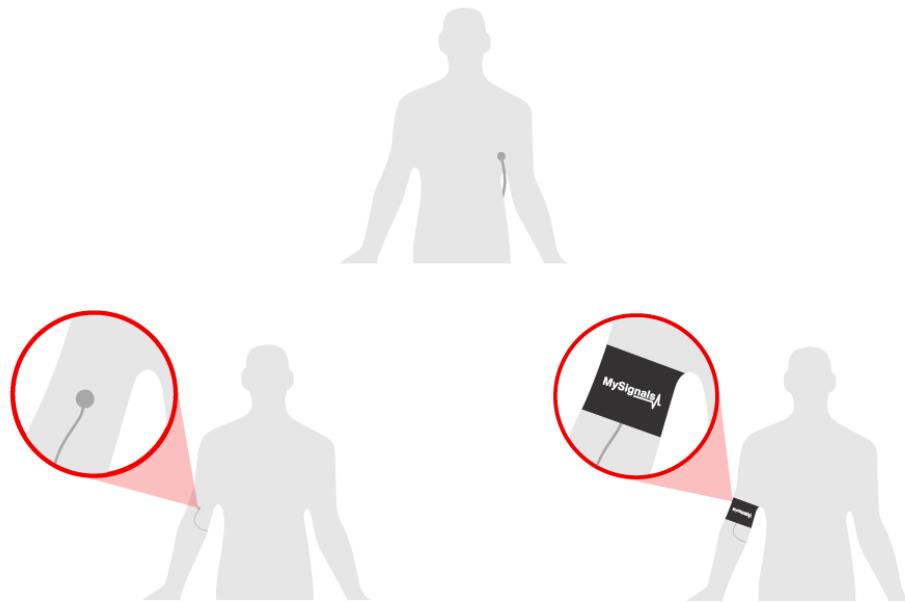
### 7.1.6.2. Connecting the sensor

Connect the sensor in the Temperature connector indicated in the MySignals Hardware board. The sensor cable have only one way of connection to prevent errors and make the connection easier.



Figure: MySignals Hardware Development Platform with Temperature connected

Place the sensor on your body making contact between the metallic part and your skin as shown in the image below. There are several options available in order to situate the sensor to the body, you can use MySignals armband for this.



After a few seconds you will get the values in the visualization method programmed.

**NOTE:** If an Appropriate sensor data on the finger is measured, it is necessary to use other more sensitive areas like the armpit.

## 7.1.6.3. Examples of use

### Standalone Mode

This is an example of sensor measuring in Standalone Mode.

First of all select the sensor that you want to measure in the Select Sensors screen. Use the touchscreen pressing in the correct simbol. You can see the selected sensors logos in blue color.



Figure: Selected sensor logo

Then you can go to General Sensor screen using the left down corner logo. MySignals will start to monitor all the parameters in General Mode where it only show numeric values.

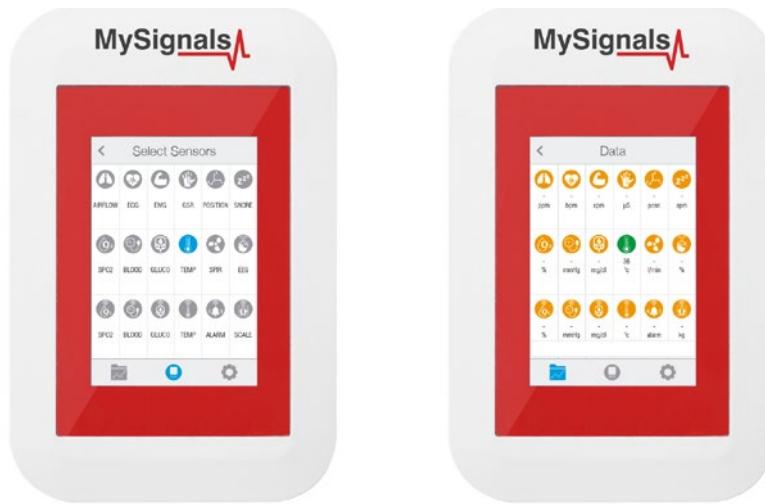


Figure: General mode and selecting general mode

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

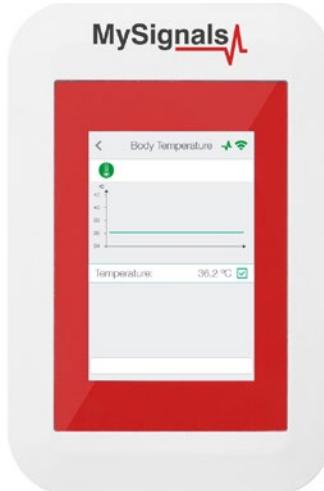


Figure: Detail mode

## MySignals App

This is an example of sensor viewing in MySignals App Mode.

First of all select the sensor that you want to measure in the Select Sensors screen. Use your smartphone touchscreen pressing in the correct simbol. You can see the selected sensors logos in blue color.



Figure: Selected sensor logo App

Then you can go to General Sensor screen using the left down corner logo. MySignals will start to monitor all the parameters in General Mode where it only show numeric values.

You can see in this screen a color code in the sensor logos:

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previously connection of some time ago.
- Grey: It is that the sensor is not connected.

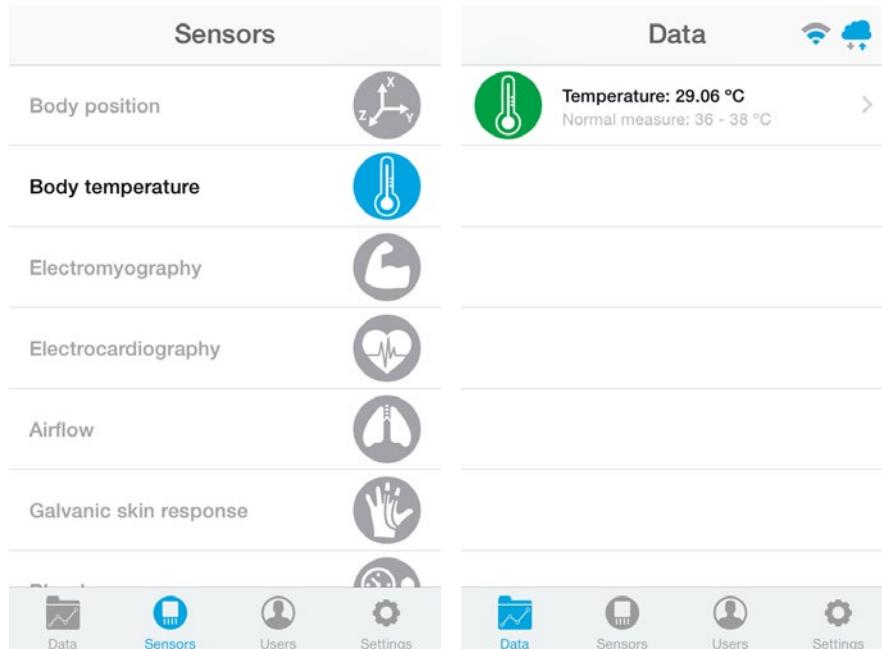


Figure: General mode and selecting general mode App

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

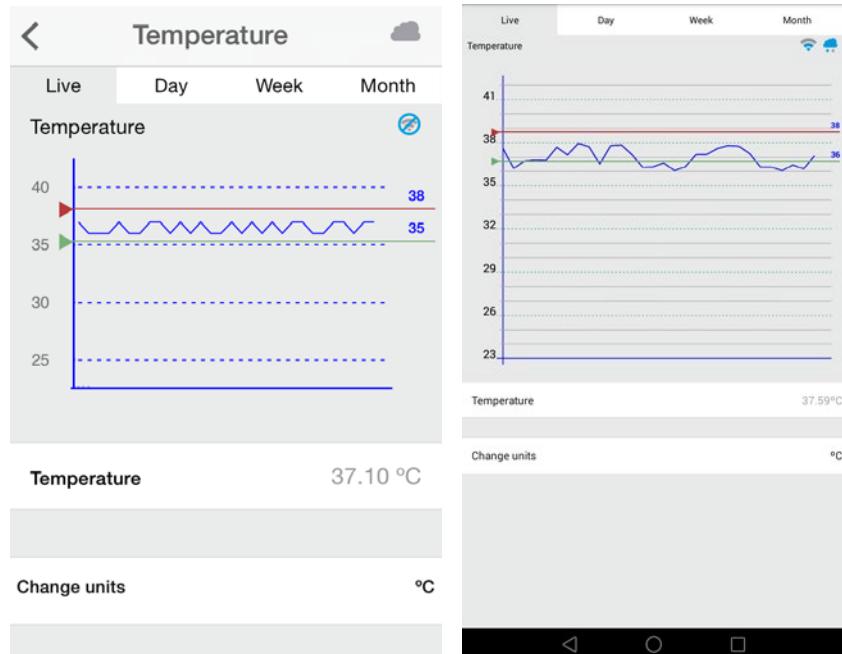


Figure: Detail mode

## MySignals Web Server

This is an example of sensor viewing in MySignals Web Server Mode.

First of all choose the sensor that you want to visualize. You can use the fast menu situated in the left side of the Web Server. Choose an user.

The screenshot shows the 'Account Settings' page of the MySignals Web Server. On the left, a sidebar lists categories: ORGANIZATION, CARDIOLOGY, DERMATOLOGY, TRAUMATOLOGY, DEVICES, and MEMBERS. The main content area has tabs for 'Updates', 'Devices', 'Members', 'Departments', and 'Account Settings'. The 'Account Settings' tab is active. It displays the following information:

Name:	Demo User (public)	Sign up:	2018-02-07 08:53:06
Email:	*****@*****.com	Last update:	2018-02-07 08:56:17
		<b>504</b>	

**Usage**

- Licence Usage Time: 24h
- Database Storage: 0 of 500000
- API Calls: Your license has not API Cloud access  
\* License expire on: 2019/01/07

**Statistics**

Category	Value
Devices	5 / 1
Members	15 / 5
Departments	3 / 1

**Usage by Member**

Member	DB records (%)	DB records	Action
Adeline Ulrich	0%	0	edit
Amelie Nicolas	0%	0	edit
Burnice McGlynn	0%	0	edit
Clifton Marks	0%	0	edit
Daryl Harvey	0%	0	edit
Jacinthe Auferhar	0%	0	edit
Jonathon Watsica	0%	0	edit
Kelly Schmitt	0%	0	edit
Kyle Mante	0%	0	edit
Laiska Hintz	0%	0	edit
Lourdes Gusikowski	0%	0	edit
Novella Bechtelar	0%	0	edit
Oliver Christiansen	0%	0	edit
Rossie Wolf	0%	0	edit
Sasha Zboracik	0%	0	edit

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Figure: Select user

You can select an upload to the cloud time interval in WiFi setting of 10, 20, 30 or 60 seconds.

Then you can see the General Sensor page. MySignals Web Server will monitor all the parameters in General Mode where it only show numeric values.

You can see in this screen a color code in the sensor logos:

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previous connection of some time ago.
- Grey: It is that the sensor is not connected.

The screenshot shows the MySignals web interface. On the left is a dark sidebar with navigation links: ORGANIZATION, CARDIOLOGY, DERMATOLOGY, TRAUMATOLOGY, DEVICES, and MEMBERS. The main area has a header "MySignals" with a logo. Below it, a "Member" section displays a profile picture of Anna Gerhold and her details: Name: Anna, Surname: Gerhold, Member ID: 25, Last update: [redacted], Height: 173 cm, Weight: 104 Kg, Birthday: 10 Jun 1987, Department: Dermatology. A "Data" section lists various sensors with their normal ranges and current values. Most icons are green, indicating real-time data. Some are orange or grey, indicating older data or no connection.

Sensor	Normal Range	Current Value
Body position	[redacted]	[redacted]
Temperature	Normal measure: 36 - 38 °C	[green icon]
Muscle contraction (cpm)	Normal measure: 0 - 10 cpm	[red icon]
Heart rate (bpm)	Normal measure: 60 - 120 bpm	[green icon]
Respiratory rate (ppm)	Normal measure: 12 - 25 ppm	[red icon]
Conductance	Normal measure: 2 - 7 µS	[red icon]
Diastolic pressure Systolic pressure	Normal measure: 40 - 80 mmHg 80 - 120 mmHg	[red icon]
Oxygen saturation	Normal measure: 95 - 98 %	[red icon]
Glucose mg	Normal measure: 72 - 114 mg/dl	[red icon]
PEF FEV1	Normal measure: 540 - 780 l/min 180 - 300 l	[red icon]
Snore rate (ppm)	Normal measure: 12 - 25 ppm	[red icon]
Weight	Normal measure: 40 - 120 Kg	[red icon]
Diastolic pressure Systolic pressure	Normal measure: 40 - 80 mmHg 80 - 120 mmHg	[red icon]
Oxygen saturation	Normal measure: 95 - 98 %	[red icon]
Glucose	Normal measure: 72 - 144 mg/dl	[red icon]
EEG Attention EEG Meditation	Normal measure: 30 - 50 % 30 - 50 %	[red icon]

Figure: General mode Web Server

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

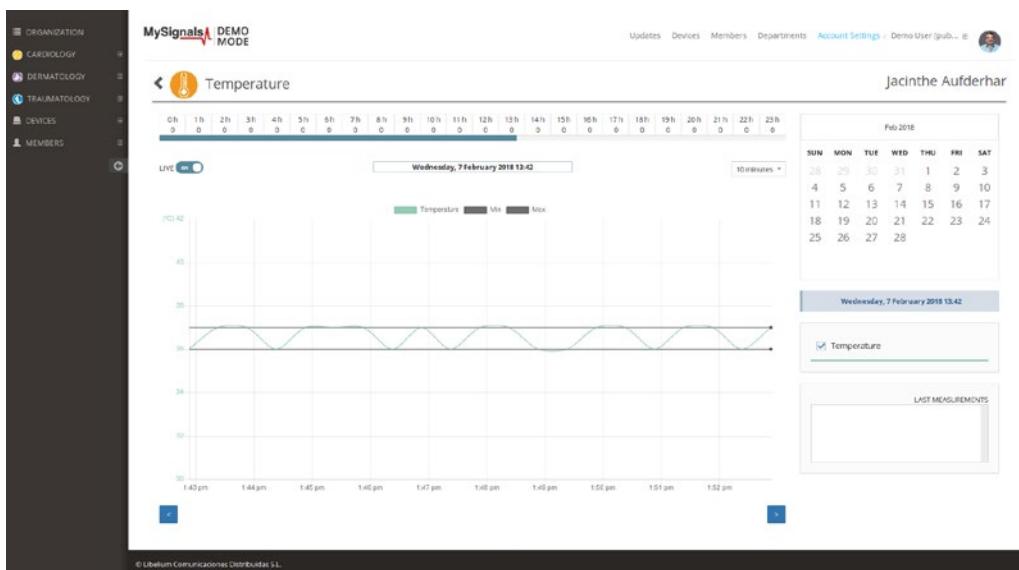


Figure: Detail mode Web Server

You can change the interval that configure MySignals to send data to the server. Introduce the value in seconds. MySignals will send data to the server as it is configured.

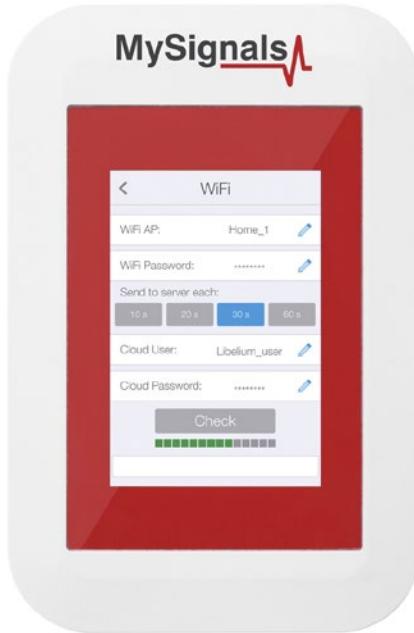


Figure: WiFi settings

## 7.1.7. EMG

Electromyography (EMG) is an electrodiagnostic medicine technique for evaluating and recording the electrical activity produced by skeletal muscles. EMG is performed using an instrument called an electromyograph, to produce a record called an electromyogram. An electromyograph detects the electric potential generated by muscle cells when these cells are electrically or neurologically activated. The signals can be analyzed to detect medical abnormalities, activation level, or recruitment order, or to analyze the biomechanics of human or animal movement.

EMG testing has a variety of clinical and biomedical Applications. EMG is used as a diagnostics tool for identifying neuromuscular diseases, or as a research tool for studying kinesiology, and disorders of motor control. EMG signals are sometimes used to guide botulinum toxin or phenol injections into muscles. EMG signals are also used as a control signal for prosthetic devices such as prosthetic hands, arms, and lower limbs.

There are two kinds of EMG: surface EMG and intramuscular EMG. Surface EMG assesses muscle function by recording muscle activity from the surface above the muscle on the skin. Surface electrodes are able to provide only a limited assessment of the muscle activity. Surface EMG can be recorded by a pair of electrodes or by a more complex array of multiple electrodes. More than one electrode is needed because EMG recordings display the potential difference (voltage difference) between two separate electrodes. Limitations of this Approach are the fact that surface electrode recordings are restricted to superficial muscles, are influenced by the depth of the subcutaneous tissue at the site of the recording which can be highly variable depending of the weight of a patient, and cannot reliably discriminate between the discharges of adjacent muscles.

### 7.1.7.1. Sensor features

**Description:** An electromyograph detects the electrical potential generated by muscle cells when these cells are electrically or neurologically activated. The signals can be analyzed to detect medical abnormalities, activation level, recruitment order or to analyze the biomechanics of human or animal movement.

EMG signals are used in many clinical and biomedical Applications. EMG is used as a diagnostics tool for identifying neuromuscular diseases, assessing low-back pain, kinesiology, and disorders of motor control. EMG signals are also used as a control signal for prosthetic devices such as prosthetic hands, arms, and lower limbs.

This sensor will measure the filtered and rectified electrical activity of a muscle, depending the amount of activity in the selected muscle.



Figure: EMG sensor

Use your muscles to control any type of actuator (motors, servos, lights ...) Interact with the environment with your own muscles. This sensor comes with everything you need to start sensing muscle activity with your Arduino.

The sensor needs to be connected to the specific EMG jack connector in MySignals board and it works with direct connector power supply.

**Measurement:**

Parameter	Unit	Range
Muscle rate	CPM (contractions per minute)	0-60 cpm
Muscle signal	Volts	0-5V

### 7.1.7.2. Connecting the sensor

Connect the sensor in the EMG connector indicated in the MySignals Hardware board. The sensor cable have only one way of connection to prevent errors and make the connection easier.



Figure: MySignals Hardware Development Platform with EMG connected

Connect the EMG lead to the electrodes.



Figure: EMG connecting EMG electrodes

Remove the protective plastic. You can use a specific conductive gel in order to improve the quality signal of the sensor.



Figure: EMG electrodes removing protective plastic

This sensor use disposable pre-gelled electrodes.

These high quality disposable electrodes are to be used to measure EEG, ECG and EMG. They are to be used once and are very handy because of integrated gel. They adhere very well to the skin and are clean to use.

The H124SG has a unique, patented pre-gelled adhesive side with non-irritating gel, especially developed to prevent allergic reactions. These foam electrode is latex free and therefore suitable for every skin type.

The snap-on connector can easily be pushed on or removed from the electrode lead.

Place the electrodes as shown below.

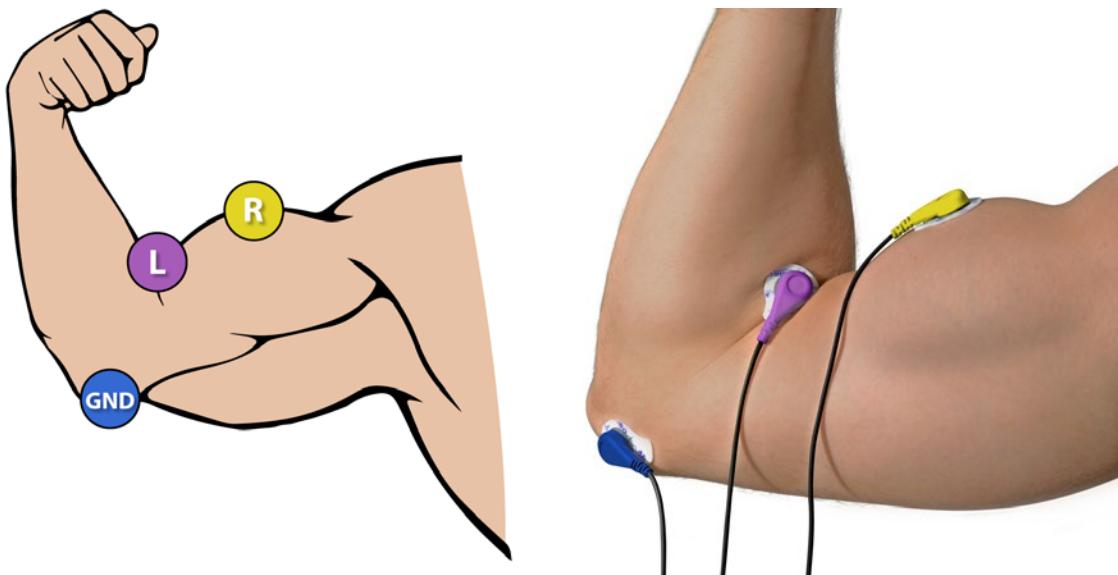


Figure: EMG position diagram

After a few seconds you will get the values in the visualization method programmed.

**NOTE:** It is recommended not use this sensor in environments with excessive electromagnetic noise.

## 7.1.7.3. Examples of use

### Standalone Mode

This is an example of sensor measuring in Standalone Mode.

First of all select the sensor that you want to measure in the Select Sensors screen. Use the touchscreen pressing in the correct symbol. You can see the selected sensors logos in blue color.



Figure: Selected sensor logo

Then you can go to General Sensor screen using the left down corner logo. MySignals will start to monitor all the parameters in General Mode where it only show numeric values.



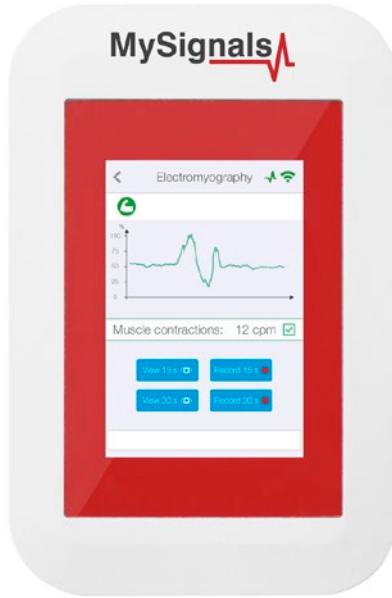
Figure: General mode and selecting general mode

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

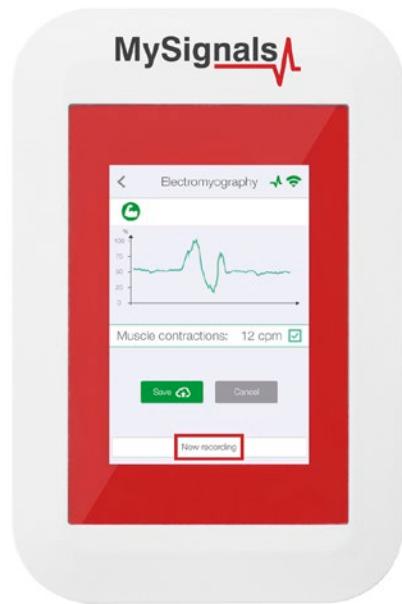


Figure: Detail mode

In September 2017 we have released new Firmware, Apps and Cloud versions that allow to record continuous waves and send them to record continuous waves and send them to the Cloud (in Server Mode). You can record 15 or 30 seconds of the data measured in detail mode of **ECG**, **EMG**, **Snore** and **Airflow**.



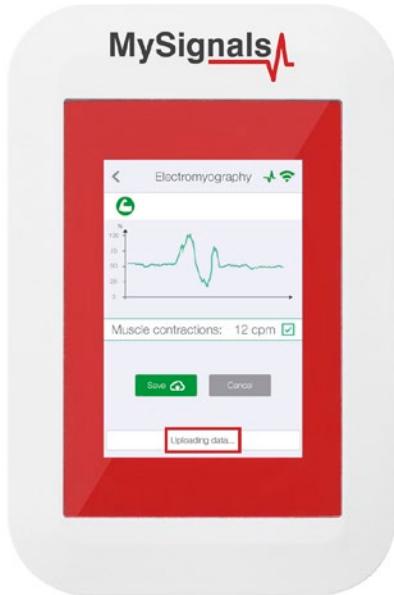
You can use this new function in Server Mode using detail mode. Use the **Record 15 seconds** or **Record 30 seconds** buttons in order to start a new record.



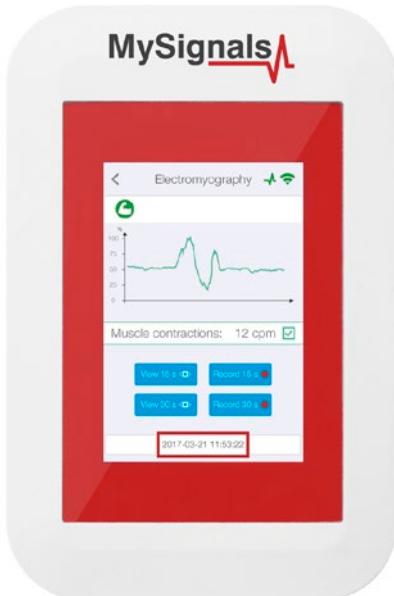
With the record finished you can choose between saving this record in the cloud or cancel it.



You will see all the information about the upload to the cloud at the bottom of the screen (text message zone).



After a correct upload you will see the date of the file saved. Then you can see this new raw data file in the Web Server or in the Mobile App.



## MySignals App

This is an example of sensor viewing in MySignals App Mode.

First of all select the sensor that you want to measure in the Select Sensors screen. Use your smartphone touchscreen pressing in the correct simbol. You can see the selected sensors logos in blue color.



Figure: Selected sensor logo App

Then you can go to General Sensor screen using the left down corner logo. MySignals will start to monitor all the parameters in General Mode where it only show numeric values.

You can see in this screen a color code in the sensor logos:

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previously connection of some time ago.
- Grey: It is that the sensor is not connected.

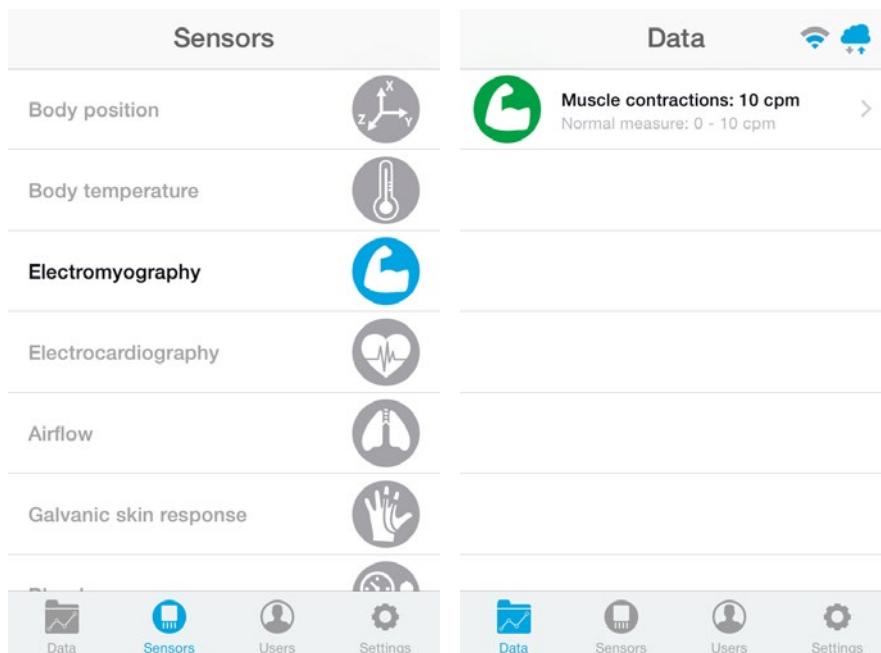


Figure: General mode and selecting general mode App

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

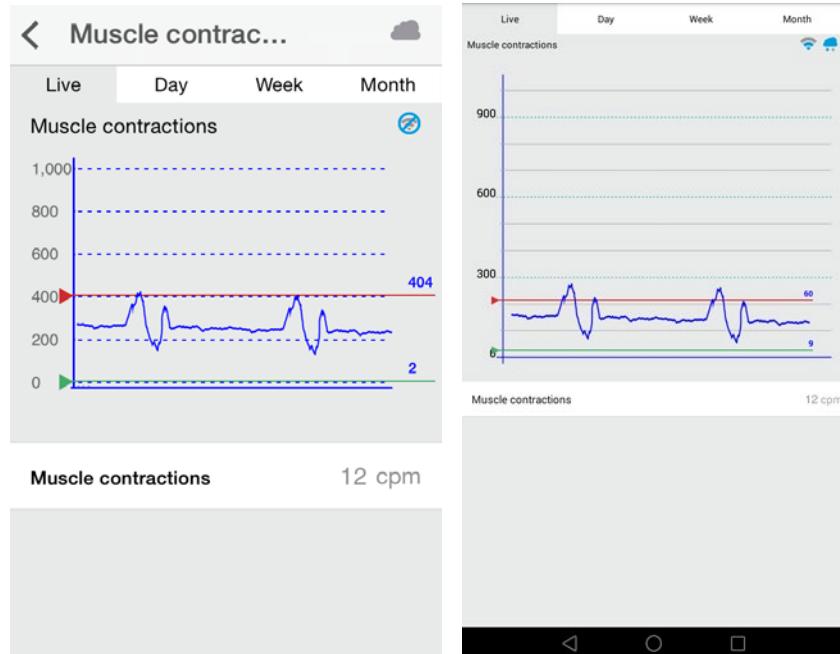
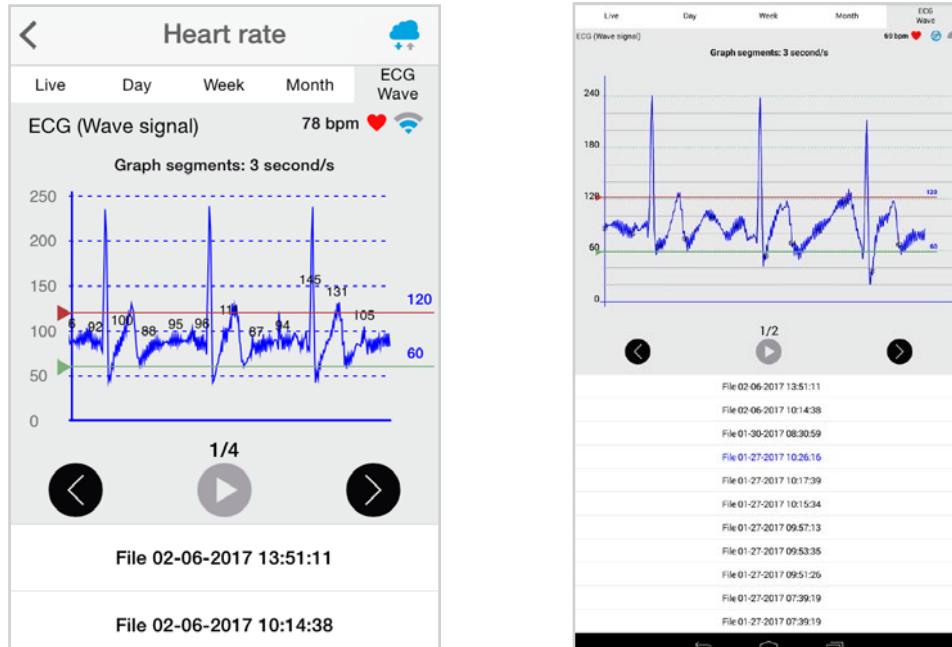


Figure: Detail mode

There is a new tab on detail screen for ECG, EMG, Airflow and Snore sensors. This tab allows the user to display raw data recorded from MySignals device (in Server Mode). You can record until 30 seconds from MySignals device and show the recorded data on raw data tab, this tab is placed on the top right of the screen.

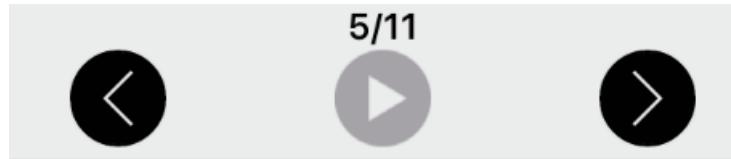
On top right, you can see the ECG rate, EMG rate, Airflow rate or Snore rate. Above the graph, you can see the graph time for X axis, in this case the graph was divided in windows of parts of 3 seconds each.



Over the graph you can notice the values for each important data peak, you can track wave changes by watching these values.

You can move the limits of the graph with the green and red lines, touch each line to move it along the graph view.

On bottom section from the graph view there are three buttons:



Right and left arrow buttons let you move the graph to right or left. In the middle position, there is a play/pause button to start or stop the carousel mode. By default and once the graph load ends, the graph animation plays automatically. For instance, if you record 30 seconds on MySignals device, the Application will show 11 parts to navigate using the left/right arrow buttons. Once the graph ends loading, the animation will play automatically.

Just above the play/pause button, you can see a little navigation legend to know which part of the full graph you are showing.

At the end of the screen you can get the list of MySignals recordings provided by the user from the device, this listing is shown in order from latest to oldest one, each row shows the recording date and time. Tap on one row to select a single recording and the mobile Application will start plotting the data on the graph, the row will be also highlighted to let the user know which row is currently plotting.

The listing rows have a sampling rate and it is about 10 milliseconds.

## MySignals Web Server

This is an example of sensor viewing in MySignals Web Server Mode.

First of all choose the sensor that you want to visualize. You can use the fast menu situated in the left side of the Web Server. Choose an user.

The screenshot shows the 'Account Settings' page of the MySignals Web Server. On the left, there is a sidebar with icons for Organization, Cardiology, Dermatology, Traumatology, Devices, and Members. The main content area has tabs for 'Updates', 'Devices', 'Members', 'Departments', 'Account Settings' (which is active), and 'Demo User (public)'. The 'Account Settings' tab displays the following information:

Name:	Demo User (public)	Sign up:	2018-02-07 08:53:06
Email:	*****@*****.com	Last update:	2018-02-07 08:56:17

Below this is a 'Usage' section showing 'License Usage Time' (9h), 'Database Storage' (0 of 500000), and 'API Calls' (Your license has not API Client access). It also shows a note about the license expiring on 2019/01/07.

The 'Statistics' section shows counts for 'Devices' (5/1), 'Members' (15/15), and 'Departments' (3/1).

The 'Usage by Member' section lists 15 members with their names and corresponding DB records (all 0). The members listed are: Adeline Ulrich, Amelie Nicolas, Burnice McGlynn, Clinton Marks, Daryl Harvey, Jocinthe Audenhar, Jonathon Watska, Kelly Schmitt, Kyle Mante, Lashia Hintz, Lourdes Gurukarawali, Novella Bechtolar, Oliver Christiansen, Rossie Wulf, and Sasha Zboncak.

Figure: Select user

You can select an upload to the cloud time interval in WiFi setting of 10, 20, 30 or 60 seconds.

Then you can see the General Sensor page. MySignals Web Server will monitor all the parameters in General Mode where it only show numeric values.

You can see in this screen a color code in the sensor logos:

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previously connection of some time ago.
- Grey: It is that the sensor is not connected.

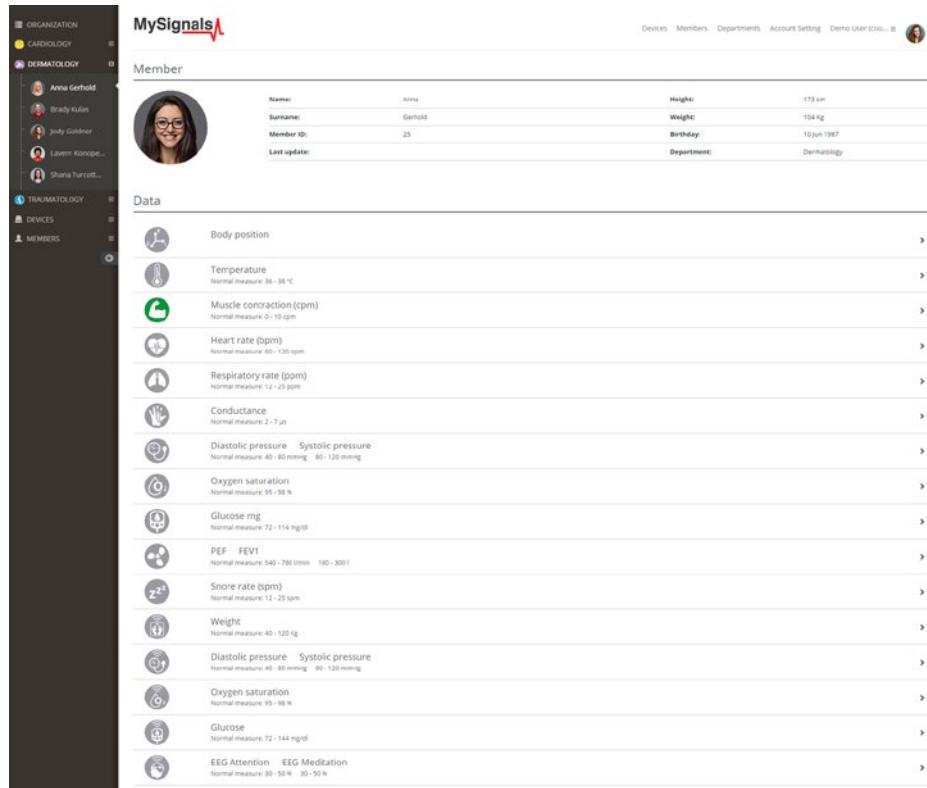


Figure: General mode Web Server

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.



Figure: Detail mode Web Server

You can change the interval that configure MySignals to send data to the server. Introduce the value in seconds. MySignals will send data to the server as it is configured.

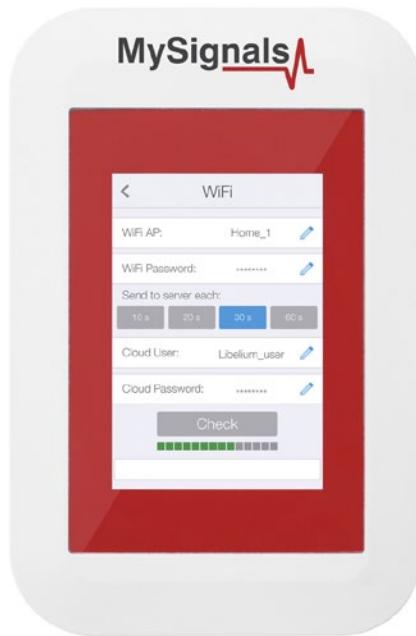


Figure: WiFi settings

## Raw data viewer

A new feature has been added allowing us to see the raw data, also known as wave signal, for the sensors: Airflow, ECG, EMG and Snore.

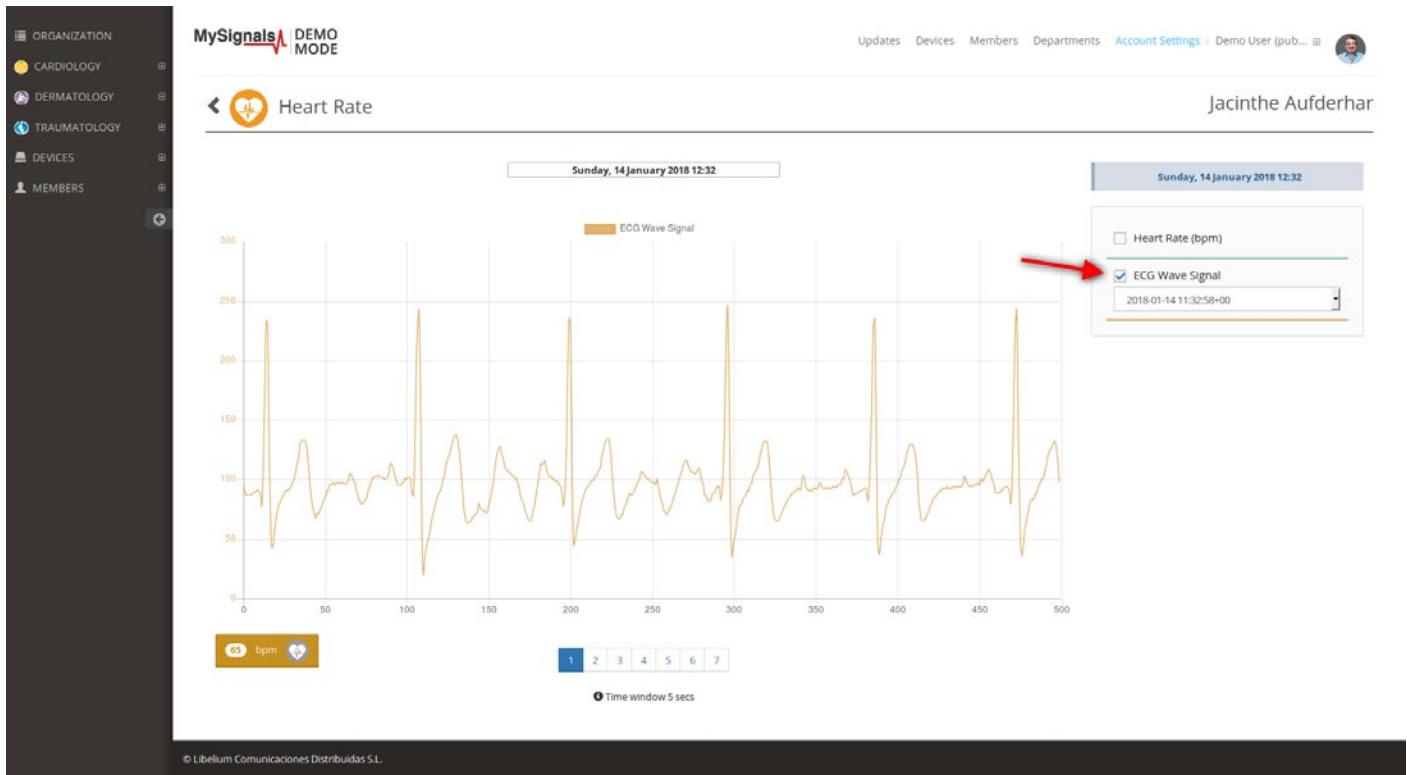
The screenshot shows the MySignals member detail page for a user named Esta Hane. The left sidebar includes sections for Organization, Cardiology (selected), Dermatology, Traumatology, Devices, and Members. The main content area is titled 'Member' and shows Esta's profile picture and basic information: Name: Esta, Surname: Hane, Member ID: 5, Last update: 2017-02-06 06:51:22-05:00. Below this is the 'Data' section, which lists various sensor readings with their normal ranges and a 'View' link. Red arrows point to the icons for Heart rate (blue heart), Muscle contraction (orange muscle), Respiratory rate (yellow lungs), and Snore rate (red zzz).

Sensor	Value	Normal Range	Action
Body position	non-defined position		>
Temperature	25.73 °C	Normal measure: 36 - 38 °C	>
Muscle contraction	0 cpm	Normal measure: 0 - 10 cpm	>
Heart rate	106 bpm	Normal measure: 60 - 120 bpm	>
Respiratory rate	0 ppm	Normal measure: 12 - 25 ppm	>
Conductance	2764.87 µS	Normal measure: 2 - 7 µS	>
Diastolic pressure	Systolic pressure	Normal measure: 40 - 80 mmHg    80 - 120 mmHg	>
Oxygen saturation		Normal measure: 95 - 98 %	>
Glucose mg		Normal measure: 72 - 114 mg/dl	>
PEF	FEV1	Normal measure: 540 - 780 l/min    180 - 300 l	>
Snore rate	(spm)	Normal measure: 12 - 25 spm	>
Weight		Normal measure: 40 - 120 Kg	>
Diastolic pressure	Systolic pressure	Normal measure: 40 - 80 mmHg    80 - 120 mmHg	>
Oxygen saturation		Normal measure: 95 - 98 %	>
Glucose		Normal measure: 72 - 144 mg/dl	>
EEG Attention	EEG Meditation	Normal measure: 30 - 50 %    30 - 50 %	>

The member detail page shows a general view of the last values received for the different sensors.

Please select one of the following sensors in order to go to the sensor detail page:

- Airflow: (Respiratory rate)
- ECG: (Heart rate)
- EMG: (Muscle contraction)
- Snore: (Snore rate)



Once in this page click the 'Wave Signal' tab.

In the bottom right of the page there is a dropdown selector with the available raw values sorted by date. Select one of this an you will see the wave that was recorded using the MySignals hardware.



In the bottom center there is a pagination control that you can use for navigating the wave, going ahead and backwards in the timeline.



In the bottom left part of the page it's displayed the average value for bpm, ppm, cpm or spm for the entire period of the wave recorded.



## 7.1.8. Spirometer

Spirometry (meaning the measuring of breath) is the most common of the pulmonary function tests (PFTs), measuring lung function, specifically the amount (volume) and/or speed (flow) of air that can be inhaled and exhaled. Spirometry is an important tool used for generating pneumotachographs, which are helpful in assessing conditions such as asthma, pulmonary fibrosis, cystic fibrosis, and COPD.

### 7.1.8.1. Sensor features

**Description:** MySignals Spirometer Peak Flow Meter is a hand-held pulmonary function measuring device that measures your maximum possible exhalation which is called peak expiratory flow (PEF) and forced expiratory volume in 1 second (FEV1).

#### Forced expiratory flow (FEF)

Forced expiratory flow (FEF) is the flow (or speed) of air coming out of the lung during the middle portion of a forced expiration.

#### Forced expiratory volume in 1 second (FEV1)

FEV1 is the volume of air that can forcibly be blown out in one second, after full inspiration. Average values for FEV1 in healthy people depend mainly on sex and age, according to the diagram at left. Values of between 80% and 120% of the average value are considered normal.



Figure: Spirometer sensor

It is suitable for children through adults who are capable of following the instructions for use. Because the Meter has an automatic memory, you can take the Meter with you the next time you connect to MySignals board for a review of many readings.

**Accuracy requirement**

Volume range	0.01L~9.99L	Airflow range	50 L/min ~900L/min
Volume accuracy	±0.050L or ±3%	Airflow accuracy	±10% or ±20L/min

**Resolution**

Volume resolution	0.01L	Airflow resolution	1L/min
-------------------	-------	--------------------	--------

**Resistance to flow**

Back pressure @ 660L/min	<0.11 KPa/sec
Back pressure @ 900L/min	<0.15 KPa/sec

**Measurement:**

Parameter	Unit	Range
Volume	l	0.01L~9.99L
Air flow	l/min	50 L/min ~900L/min

This sensor uses 2 AAA batteries.

### 7.1.8.2. Connecting the sensor

Connect the sensor in the Spirometer connector indicated in the MySignals Hardware board. The sensor cable have only one way of connection to prevent errors and make the connection easier. Use the mini-USB connector to link the Spirometer with the MySignals board, using the normal jack connector (3.5mm) of the cable in this side.

Before start using the Spirometer we need one measure at least in the memory of the Spirometer. After that we can get all the information contained in the Spirometer (date, PEF, FEV1).



Figure: Insert the disposable mouthpiece in the Spirometer.

- 1) Place a new disposable mouthpiece for each new user in the machine and press the ON button. When the machine is ready you can start the measurement. In this step the device should be disconnected to MySignals.



Figure: Ready for measurement Spirometer

Sit on the edge of your bed if possible, or sit up as far as you can in bed. Hold the Spirometer in an upright position.

Place the mouthpiece in your mouth and seal your lips tightly around it. Breathe in fast and as deeply as possible.

- 2) Press the ON button in order to turn off the device. It is necessary in order to store the measure correctly.



Figure: Spirometer measure

The Spirometer will store the value in the memory.

3) In order to extract the data from the Spirometer to the Arduino, connect the Spirometer to MySignals with the cable as show in the picture.



Figure: Cable connection

You should view in the Spirometer screen a USB logo indication, that indicates the correct connection.



Figure: PC indication Spirometer

### **Deleting data stored**

The maximum recommended number of measures stored in the Spirometer is 7. Please delete all the measures after it using the example code "spirometer\_delete\_measures" that you can find in the next sections.

### **Powering the sensor**

It is very important to use batteries with more than 50% of charge in order to obtain correctly the biometric information.

## Setting time

In order to use the date and time in each measure it is necessary to set correctly these parameters in the device.



Figure: MySignals Hardware Development Platform with Spirometer DATE

Set time information after inserting new batteries. When you start with new batteries the sensor initializes the configuration of these parameters. Use the buttons to configure this information.



Figure: Configuration button in the Spirometer

## 7.1.8.3. Examples of use

### Standalone Mode

This is an example of sensor measuring in Standalone Mode.

First of all select the sensor that you want to measure in the Select Sensors screen. Use the touchscreen pressing in the correct simbol. You can see the selected sensors logos in blue color.



Figure: Selected sensor logo

Then you can go to General Sensor screen using the left down corner logo. MySignals will start to monitor all the parameters in General Mode where it only show numeric values.

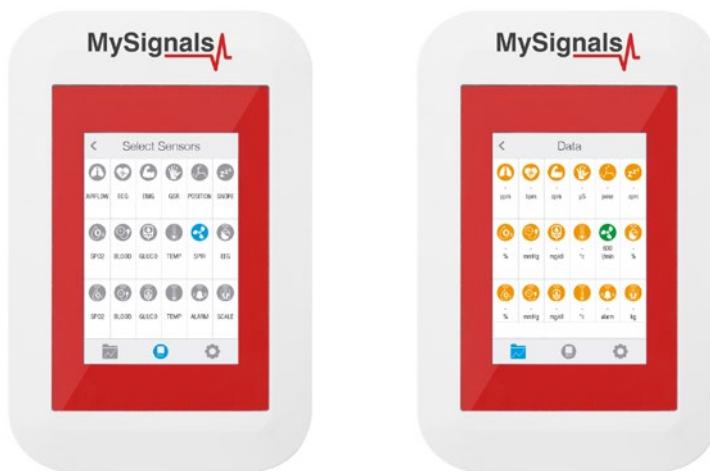


Figure: General mode and selecting general mode

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

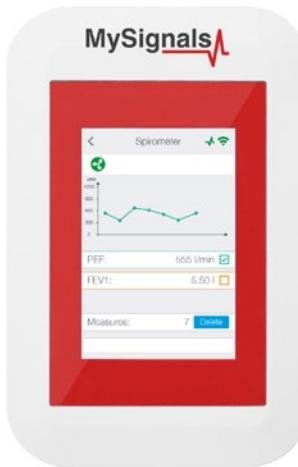


Figure: Detail mode

In detail mode of Spirometer sensor, you can use the DELETE button in order to delete the Spirometers measures stored in the sensor (it should be connected when you press it).

## MySignals App

This is an example of sensor viewing in MySignals App Mode.

First of all select the sensor that you want to measure in the Select Sensors screen. Use your smartphone touchscreen pressing in the correct simbol. You can see the selected sensors logos in blue color.



Figure: Selected sensor logo App

Then you can go to General Sensor screen using the left down corner logo. MySignals will start to monitor all the parameters in General Mode where it only show numeric values.

You can see in this screen a color code in the sensor logos:

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previously connection of some time ago.
- Grey: It is that the sensor is not connected.

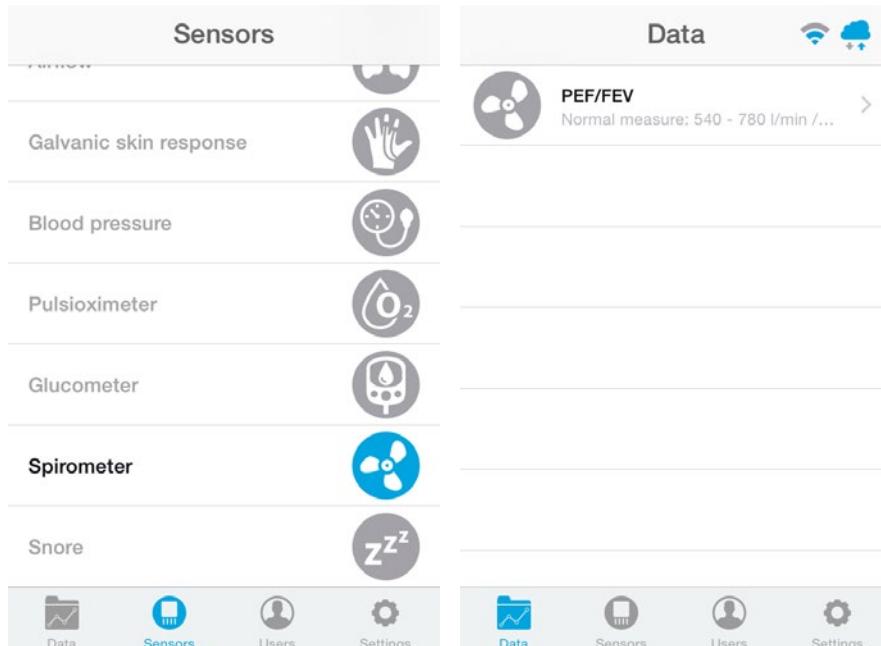


Figure: General mode and selecting general mode App

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

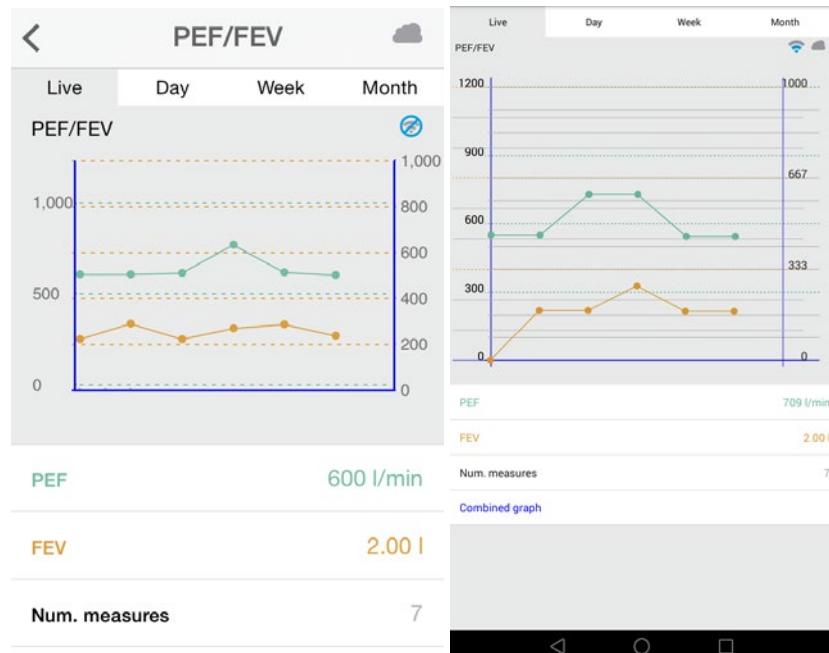


Figure: Detail mode

## MySignals Web Server

This is an example of sensor viewing in MySignals Web Server Mode.

First of all choose the sensor that you want to visualize. You can use the fast menu situated in the left side of the Web Server. Choose an user.

The screenshot shows the 'Account Settings' page of the MySignals Web Server. On the left, a sidebar lists categories: ORGANIZATION, CARDIOLOGY, DERMATOLOGY, TRAUMATOLOGY, DEVICES, and MEMBERS. The main content area has tabs for 'Updates', 'Devices', 'Members', 'Departments', and 'Account Settings'. The 'Account Settings' tab is active. It displays the following information:

Name:	Demo User (public)	Sign up:	2018-02-07 08:53:06
Email:	*****@*****.com	Last update:	2018-02-07 08:56:17
<b>Usage</b>		<b>Statistics</b>	
Licence Usage Time 100%	Database Storage 0 of 500000	Devices 5 / 1	Members 15 / 5
API Calls Your license has not API Cloud access * License expire on: 2019/01/07		Departments 3 / 1	

**Usage by Member:**

Member	DB records (%)	DB records	Action
Adeline Ulrich	0	0	
Amelie Nicolas	0	0	
Burnice McGlynn	0	0	
Clifton Marks	0	0	
Daryl Harvey	0	0	
Jacinthe Auferhar	0	0	
Jonathon Watsica	0	0	
Kelly Schmitt	0	0	
Kyle Mante	0	0	
Laiska Hintz	0	0	
Lourdes Guslowski	0	0	
Novella Bechtelar	0	0	
Oliver Christiansen	0	0	
Rossie Wolf	0	0	
Sasha Zboncak	0	0	

Figure: Select user

You can select an upload to the cloud time interval in WiFi setting of 10, 20, 30 or 60 seconds.

Then you can see the General Sensor page. MySignals Web Server will monitor all the parameters in General Mode where it only show numeric values.

You can see in this screen a color code in the sensor logos:

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previous connection of some time ago.
- Grey: It is that the sensor is not connected.

The screenshot shows the MySignals web interface in General mode. On the left, a sidebar lists categories like Organization, Cardiology, Dermatology, Traumatology, Devices, and Members. The main area displays a member profile for "Anna Gerhold" with details such as Name: Anna, Surname: Gerhold, Member ID: 25, Last update: [redacted], Height: 173 cm, Weight: 104 kg, Birthday: 10 Jun 1987, and Department: Dermatology. Below this is a "Data" section listing various sensors with their normal ranges and current values. Most icons are green, indicating real-time measurement. Some are orange, indicating old measurements, and a few are grey, indicating no connection.

Sensor	Normal Range	Current Value
Body position	[redacted]	[redacted]
Temperature	Normal measure: 36 - 38°C	[redacted]
Muscle contraction (cpm)	Normal measure: 0 - 10 cpm	[redacted]
Heart rate (bpm)	Normal measure: 60 - 120 bpm	[redacted]
Respiratory rate (ppm)	Normal measure: 12 - 25 ppm	[redacted]
Conductance	Normal measure: 2 - 7 µs	[redacted]
Diastolic pressure Systolic pressure	Normal measure: 40 - 80 mmHg 80 - 120 mmHg	[redacted]
Oxygen saturation	Normal measure: 95 - 98 %	[redacted]
Glucose mg	Normal measure: 72 - 114 mg/dl	[redacted]
PEF FEV1	Normal measure: 540 - 780 l/min 180 - 300 l	[redacted]
Snore rate (ppm)	Normal measure: 12 - 25 ppm	[redacted]
Weight	Normal measure: 40 - 120 kg	[redacted]
Diastolic pressure Systolic pressure	Normal measure: 40 - 80 mmHg 80 - 120 mmHg	[redacted]
Oxygen saturation	Normal measure: 95 - 98 %	[redacted]
Glucose	Normal measure: 72 - 144 mg/dl	[redacted]
EEG Attention EEG Meditation	Normal measure: 30 - 50 % 30 - 50 %	[redacted]

Figure: General mode Web Server

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

The screenshot shows the MySignals web interface in Detail mode for a Spirometer. The sidebar remains the same. The main area features a graph titled "Spirometer" showing PEF (Peak Expiratory Flow) and FEV1 (Forced Expiratory Volume in one second) over time from 0h to 23h on Wednesday, 7 February 2018. The graph has two lines: a green line for PEF and an orange line for FEV1. Both lines show periodic peaks and troughs. To the right of the graph is a calendar for February 2018 and a "LAST MEASUREMENTS" section. At the bottom, there is a copyright notice: "© Libelium Comunicaciones Distribuidas S.L."

Figure: Detail mode Web Server

You can change the interval that configure MySignals to send data to the server. Introduce the value in seconds. MySignals will send data to the server as it is configured.

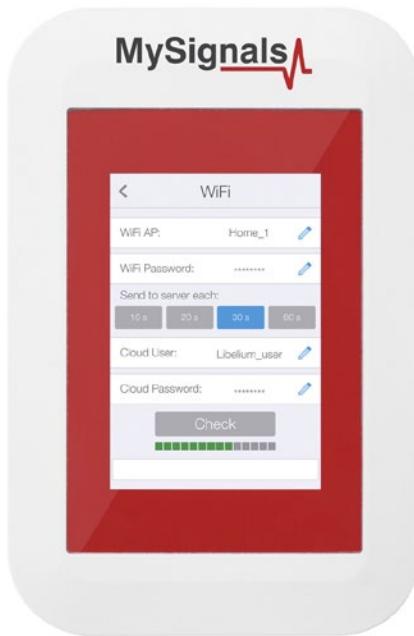


Figure: WiFi settings

## 7.1.9. GSR

Skin conductance, also known as galvanic skin response (GSR) is a method of measuring the electrical conductance of the skin, which varies with its moisture level. This is of interest because the sweat glands are controlled by the sympathetic nervous system, so moments of strong emotion, change the electrical resistance of the skin. Skin conductance is used as an indication of psychological or physiological arousal. The Galvanic Skin Response Sensor (GSR - Sweating) measures the electrical conductance between 2 points, and is essentially a type of ohmmeter.

### 7.1.9.1. Sensor features

Description: This sensor measures the electrical conductance of the skin, which varies with its moisture level. This is of interest because the sweat glands are controlled by the sympathetic nervous system, so moments of strong emotion, change the electrical resistance of the skin.



Figure: GSR Sensor

In skin conductance response method, conductivity of skin is measured at fingers of the palm. The principle or theory behind functioning of galvanic response sensor is to measure electrical skin resistance based on sweat produced by the body. When high level of sweating takes place, the electrical skin resistance drops down. A dryer skin records much higher resistance. The skin conductance response sensor measures the psycho galvanic reflex of the body. Emotions such as excitement, stress, shock, etc. can result in the fluctuation of skin conductivity. Skin conductance measurement is one component of polygraph devices and is used in scientific research of emotional or physiological arousal.

The sensor needs to be connected to the specific GSR jack connector in MySignals board and it works with direct connector power supply.

#### Measurement:

Parameter	Unit	Range
Conductance	Siemens	0-20 Siemens
Resistance	Ohms	10K-100KOhms
Voltage	Volts	0-5V

### 7.1.9.2. Connecting the sensor

Connect the sensor in the GSR connector indicated in the MySignals Hardware board. The sensor cable have only one way of connection to prevent errors and make the connection easier.



Figure: MySignals Hardware Development Platform with GSR connected

Connect the GSR lead to the electrodes.



Figure: GSR connecting GSR electrodes

Place the electrodes as shown below.

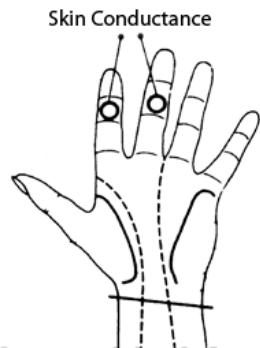


Figure: EMG position diagram

The galvanic skin sensor has two contacts and it works like a ohmmeter measuring the resistance of the materials. Place your fingers in the metallic contacts and tighten the velcro as shown in the image below.



Figure: MySignals Hardware Development Platform with GSR situated in the user body

After a few seconds you will get the values in the visualization method programmed.

## 7.1.9.3. Examples of use

### Standalone Mode

This is an example of sensor measuring in Standalone Mode.

First of all select the sensor that you want to measure in the Select Sensors screen. Use the touchscreen pressing in the correct simbol. You can see the selected sensors logos in blue color.



Figure: Selected sensor logo

Then you can go to General Sensor screen using the left down corner logo. MySignals will start to monitor all the parameters in General Mode where it only show numeric values.

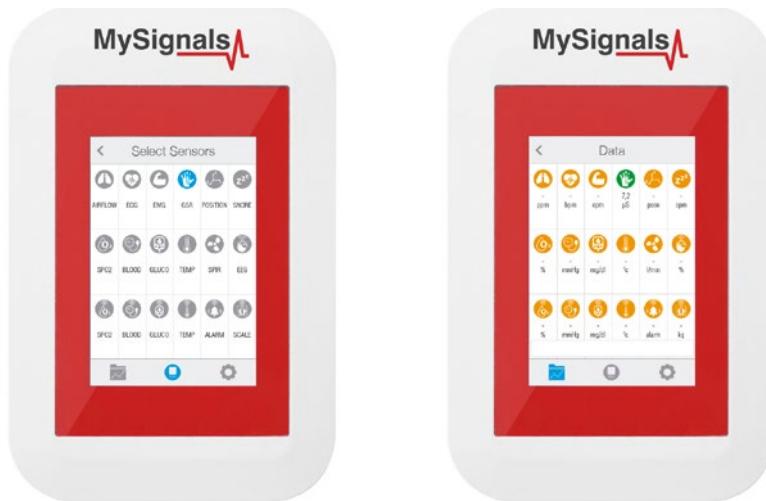


Figure: General mode and selecting general mode

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.



Figure: Detail mode

## MySignals App

This is an example of sensor viewing in MySignals App Mode.

First of all select the sensor that you want to measure in the Select Sensors screen. Use your smartphone touchscreen pressing in the correct simbol. You can see the selected sensors logos in blue color.



Figure: Selected sensor logo App

Then you can go to General Sensor screen using the left down corner logo. MySignals will start to monitor all the parameters in General Mode where it only show numeric values.

You can see in this screen a color code in the sensor logos:

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previously connection of some time ago.
- Grey: It is that the sensor is not connected.

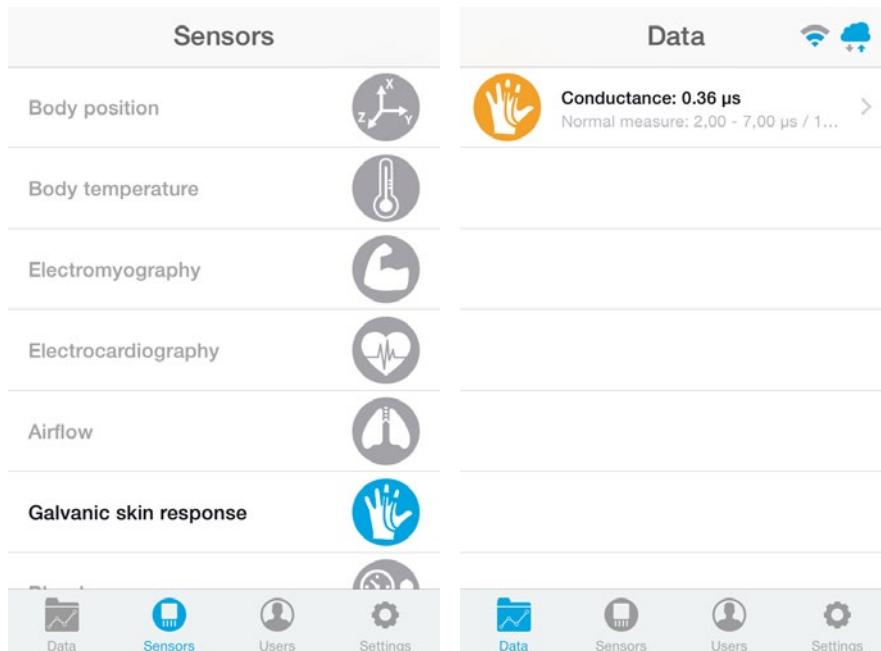


Figure: General mode and selecting general mode App

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

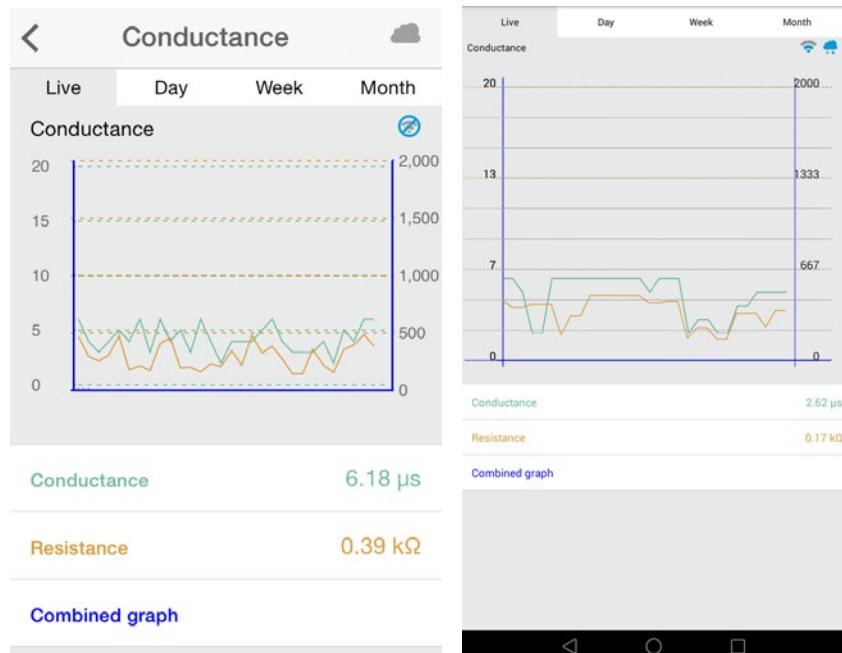


Figure: Detail mode

## MySignals Web Server

This is an example of sensor viewing in MySignals Web Server Mode.

First of all choose the sensor that you want to visualize. You can use the fast menu situated in the left side of the Web Server. Choose an user.

The screenshot shows the 'Account Settings' page of the MySignals Web Server. On the left, a sidebar lists categories: ORGANIZATION, CARDIOLOGY, DERMATOLOGY, TRAUMATOLOGY, DEVICES, and MEMBERS. The main content area has tabs for 'Updates', 'Devices', 'Members', 'Departments', and 'Account Settings' (which is active). Below these tabs, it shows 'Account Settings' for 'Demo User (public)'. It includes fields for Name (Demo User (public)), Email (\*\*\*\*\*), Sign up: 2018-02-07 08:53:06, Last update: 2018-02-07 08:56:17, and a 'Logout' button. Below this is a 'Usage' section with 'License Usage Time' (24h), 'Database Storage' (0 of 500000), and 'API Calls' (Your license has not API Cloud access, \* License expire on: 2019/01/07). To the right is a 'Statistics' section showing 5/1 devices, 15/5 members, and 3/1 departments. The bottom section is 'Usage by Member', listing 15 members with 0 DB records each. At the bottom of the page is a footer with the text '© Libelium Comunicaciones Distribuidas S.L.'.

Figure: Select user

You can select an upload to the cloud time interval in WiFi setting of 10, 20, 30 or 60 seconds.

Then you can see the General Sensor page. MySignals Web Server will monitor all the parameters in General Mode where it only show numeric values.

You can see in this screen a color code in the sensor logos:

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previous connection of some time ago.
- Grey: It is that the sensor is not connected.

The screenshot shows the MySignals web interface. On the left is a dark sidebar with a navigation menu: ORGANIZATION, CARDIOLOGY, DERMATOLOGY, DEVICES, and MEMBERS. The main area has a header "MySignals" with a red heart icon. Below it is a "Member" section showing profile information for "Anna Gerhold": Name (Anna), Surname (Gerhold), Member ID (25), Height (173 cm), Weight (104 kg), Birthday (10 Jun 1987), and Department (Dermatology). Below this is a "Data" section with a list of sensors and their normal ranges:

- Body position
- Temperature (Normal measure: 35 - 38 °C)
- Muscle contraction (cpm) (Normal measure: 0 - 10 cpm)
- Heart rate (bpm) (Normal measure: 60 - 120 bpm)
- Respiratory rate (ppm) (Normal measure: 12 - 25 ppm)
- Conductance (Normal measure: 2 - 7 µS)
- Diastolic pressure - Systolic pressure (Normal measure: 40 - 80 mmHg - 80 - 120 mmHg)
- Oxygen saturation (Normal measure: 95 - 98 %)
- Glucose mg (Normal measure: 72 - 114 mg/dL)
- PEF - FEV1 (Normal measure: 540 - 780 l/min - 180 - 300 l)
- Snore rate (spm) (Normal measure: 12 - 25 spm)
- Weight (Normal measure: 40 - 120 kg)
- Diastolic pressure - Systolic pressure (Normal measure: 40 - 80 mmHg - 80 - 120 mmHg)
- Oxygen saturation (Normal measure: 95 - 98 %)
- Glucose (Normal measure: 72 - 144 mg/dL)
- EEG Attention - EEG Meditation (Normal measure: 30 - 50 % - 30 - 50 %)

Figure: General mode Web Server

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

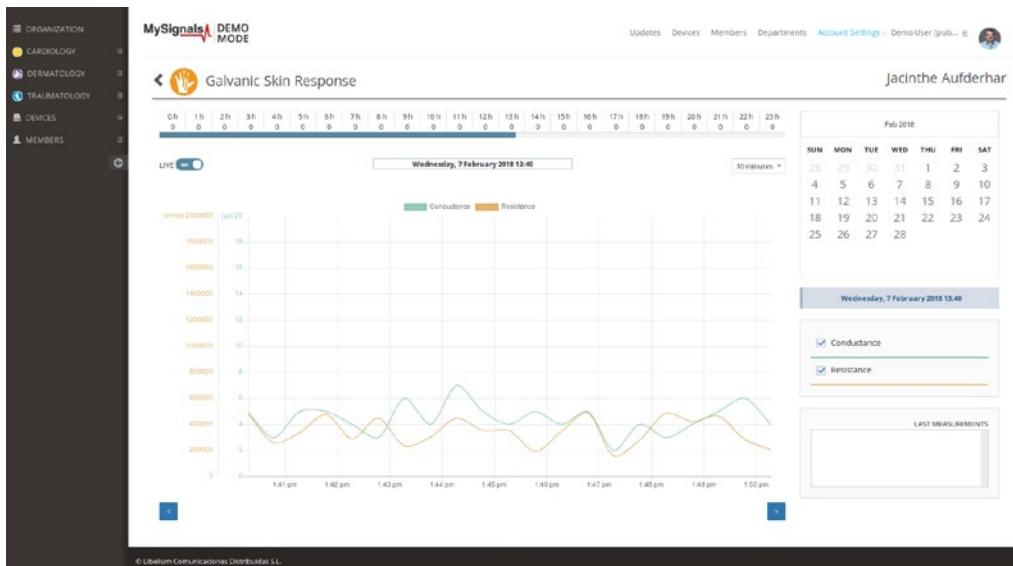


Figure: Detail mode Web Server

You can change the interval that configure MySignals to send data to the server. Introduce the value in seconds. MySignals will send data to the server as it is configured.

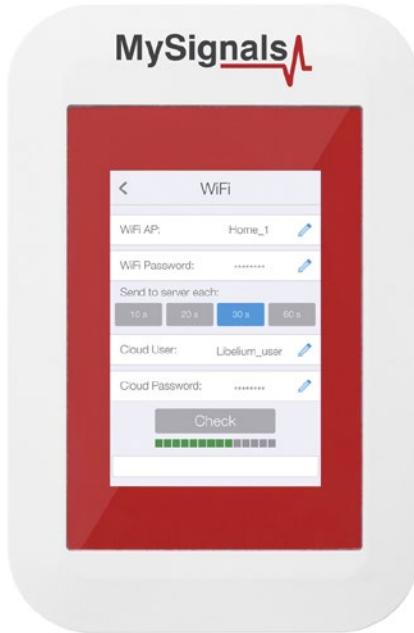


Figure: WiFi settings

## 7.1.10. Body Position

Positions and movements made because of their relationships to particular diseases (i.e., sleep apnea and restless legs syndrome). Analyzing movements during sleep also helps in determining sleep quality and irregular sleeping patterns. The body position sensor could help also to detect fainting or falling of elderly people or persons with disabilities.

### 7.1.10.1. Sensor features

**Description:** The Patient Position Sensor (Accelerometer) monitors five different patient positions (standing/sitting, supine, prone, left and right.). Body Position Sensor uses a triple axis accelerometer to obtain the patient's position.



Figure: Body Position Sensor

Body Position Sensor uses a triple axis accelerometer to obtain the patient's position. It is an ultra small triaxial, low-g acceleration sensor I2C interface, aiming for lowpower consumer market Applications. It allows measurement of accelerations in 3 perpendicular axes and thus senses tilt, motion, shock and vibration in cell phones, handhelds, computer peripherals, man-machine interfaces, virtual reality features and game controllers. The sensor needs to be connected to the specific Body Position jack connector in MySignals board and it works with direct connector power supply.

The sensor needs to be connected to the specific body position jack connector in MySignals board and it works with direct connector power supply.

- 2.0-3.6V V supply voltage
- $\pm 2g/\pm 4g/\pm 8g/\pm 16g$  selectable full-scale

#### Body positions:

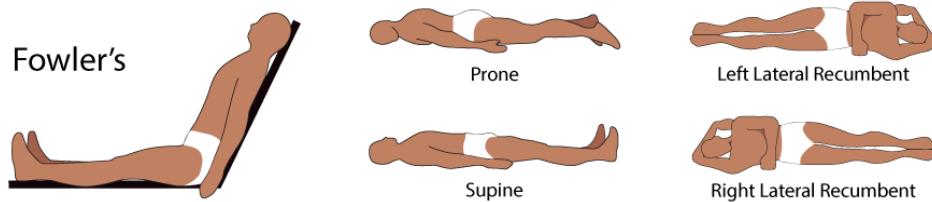


Figure: Human Body Positions

#### Measurement:

Parameter	Unit	Range
Body Position	Human Body Position	5 different positions

### 7.1.10.2. Connecting the sensor

Connect the jack sensor in the Body Position connector indicated in the MySignals Hardware board. The sensor cable have only one way of connection to prevent errors and make the connection easier.



Figure: MySignals Hardware Development Platform with Body Position connected

Place the tape around the chest and the connector placed down

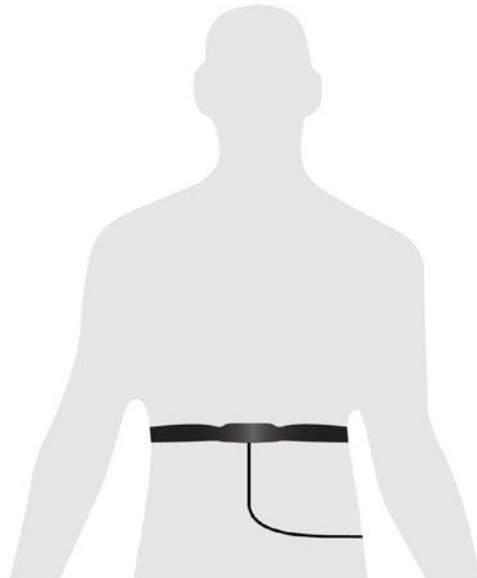


Figure: MySignals Hardware Development Platform with Body Position situated in the user body

After a few seconds you will get the values in the visualization method programmed.

## 7.1.10.3. Examples of use

### Standalone Mode

This is an example of sensor measuring in Standalone Mode.

First of all select the sensor that you want to measure in the Select Sensors screen. Use the touchscreen pressing in the correct simbol. You can see the selected sensors logos in blue color.

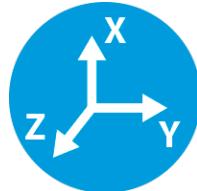


Figure: Selected sensor logo

Then you can go to General Sensor screen using the left down corner logo. MySignals will start to monitor all the parameters in General Mode where it only show numeric values.

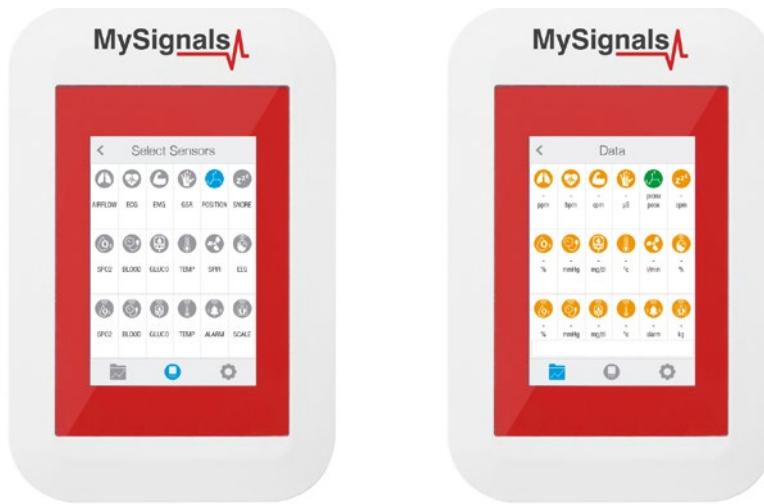


Figure: General mode and selecting general mode

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.



Figure: Detail mode

## MySignals App

This is an example of sensor viewing in MySignals App Mode.

First of all select the sensor that you want to measure in the Select Sensors screen. Use your smartphone touchscreen pressing in the correct simbol. You can see the selected sensors logos in blue color.

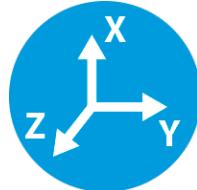


Figure: Selected sensor logo App

Then you can go to General Sensor screen using the left down corner logo. MySignals will start to monitor all the parameters in General Mode where it only show numeric values.

You can see in this screen a color code in the sensor logos:

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previously connection of some time ago.
- Grey: It is that the sensor is not connected.

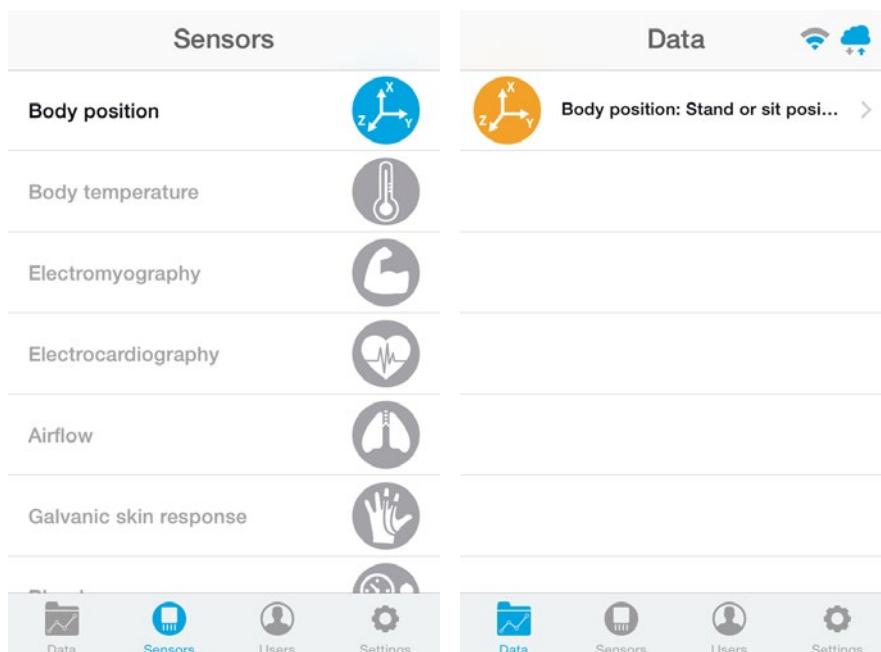


Figure: General mode and selecting general mode App

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

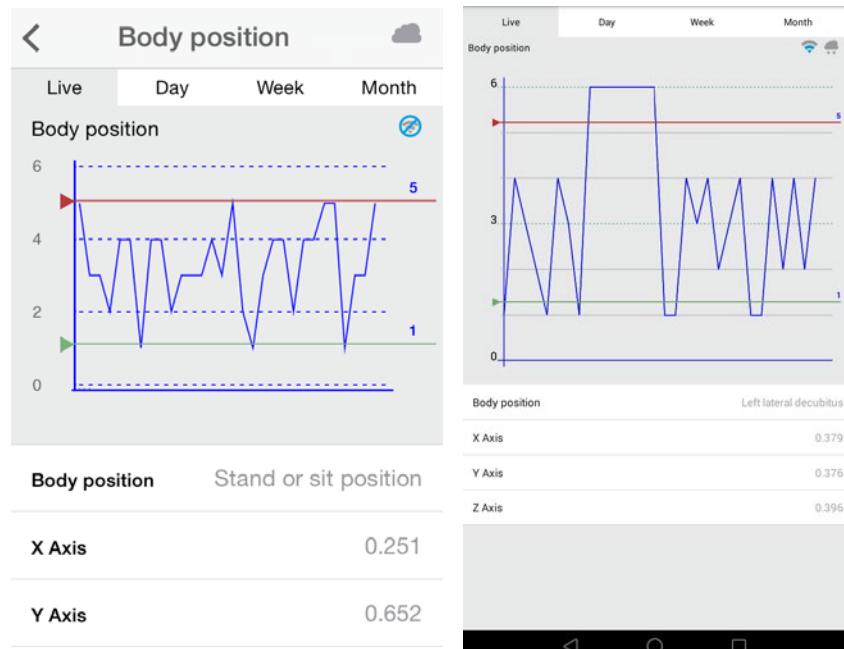


Figure: Detail mode

## MySignals Web Server

This is an example of sensor viewing in MySignals Web Server Mode.

First of all choose the sensor that you want to visualize. You can use the fast menu situated in the left side of the Web Server. Choose an user.

The screenshot shows the 'Account Settings' page of the MySignals Web Server. On the left, a sidebar lists categories: ORGANIZATION, CARDIOLOGY, DERMATOLOGY, TRAUMATOLOGY, DEVICES, and MEMBERS. The main content area has tabs for 'Updates', 'Devices', 'Members', 'Departments', and 'Account Settings'. The 'Account Settings' tab is active. It displays the following information:

Name:	Demo User (public)	Sign up:	2018-02-07 08:53:06
Email:	*****@*****.com	Last update:	2018-02-07 08:56:17
		<b>504</b>	

**Usage**

- Licence Usage Time: 2018-02-07
- Database Storage: 0 of 500000
- API Calls: Your license has not API Cloud access. \* License expire on: 2019/01/07

**Statistics**

Category	Value
Devices	5 / 1
Members	15 / 5
Departments	3 / 1

**Usage by Member**

Member	DB records (%)	DB records	Action
Adeline Ulrich	0	0	edit
Amelie Nicolas	0	0	edit
Burnice McGlynn	0	0	edit
Clifton Marks	0	0	edit
Daryl Harvey	0	0	edit
Jacinthe Auferhar	0	0	edit
Jonathon Watsica	0	0	edit
Kelly Schmitt	0	0	edit
Kyle Mante	0	0	edit
Laiska Hintz	0	0	edit
Lourdes Gusikowski	0	0	edit
Novella Bechtelar	0	0	edit
Oliver Christiansen	0	0	edit
Rossie Wolf	0	0	edit
Sasha Zboracik	0	0	edit

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Figure: Select user

You can select an upload to the cloud time interval in WiFi setting of 10, 20, 30 or 60 seconds.

Then you can see the General Sensor page. MySignals Web Server will monitor all the parameters in General Mode where it only show numeric values.

You can see in this screen a color code in the sensor logos:

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previously connection of some time ago.
- Grey: It is that the sensor is not connected.

The screenshot shows the MySignals web interface in General mode. On the left, a sidebar lists organization members: Anna Gerhold, Brady Kulas, Jody Goldner, Lauren Konopelko, and Shana Turcotte. The main area displays member details for Anna Gerhold, including her name, surname, member ID, height, weight, birthday, and department. Below this, a 'Data' section lists various sensors with their normal ranges and current values. Most values are shown in green, indicating they are real-time measurements. The sensors listed include Body position, Temperature, Muscle contraction (cpm), Heart rate (bpm), Respiratory rate (ppm), Conductance, Diastolic pressure (Systolic pressure), Oxygen saturation, Glucose mg, PEF - FEV1, Snore rate (spm), Weight, Diastolic pressure (Systolic pressure), Oxygen saturation, Glucose, and EEG Attention (EEG Meditation).

Figure: General mode Web Server

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

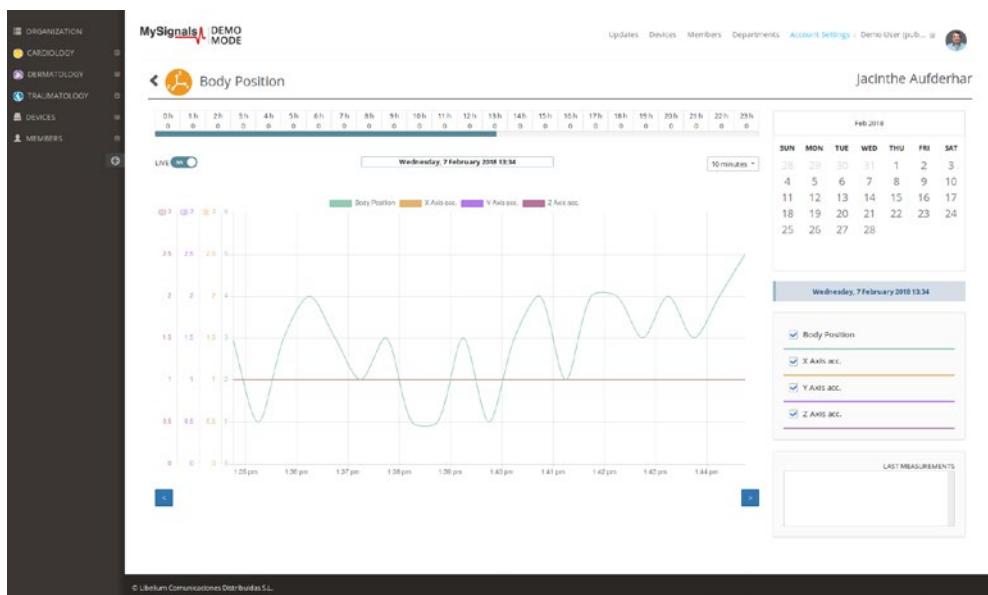


Figure: Detail mode Web Server

You can change the interval that configure MySignals to send data to the server. Introduce the value in seconds. MySignals will send data to the server as it is configured.

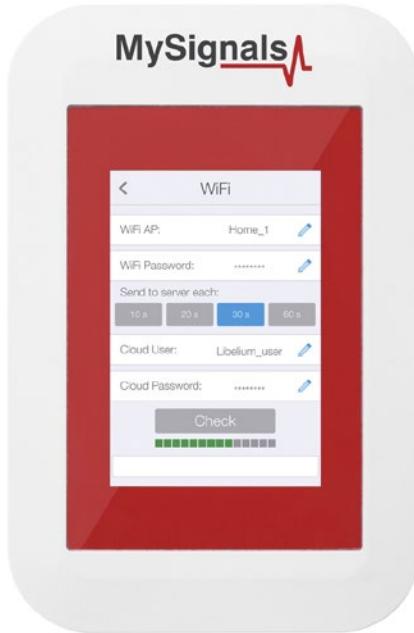


Figure: WiFi settings

## 7.1.11. Snore

Snoring is a major symptom of obstructive sleep apnea (OSA). In most sleep studies, snoring is detected with a microphone. Since these studies analyze the acoustic properties of snoring, they need to acquire data at high sampling rates, so a large amount of data should be processed. Recently, several sleep studies have monitored snoring using a piezo snoring sensor. However, an automatic method for snoring detection using a piezo snoring sensor has not been reported in the literature. This study proposed the HMM-based method to detect snoring using this sensor, which is attached to the neck. The data from 21 patients with OSA were gathered for training and test sets. The short-time Fourier transform and short-time energy were computed so they could be applied to HMMs. The data were classified as snoring, noise and silence according to their HMMs. As a result, the sensitivity and the positive predictivity values were 93.3% and 99.1% for snoring detection, respectively. The results demonstrated that the method produced simple, portable and user-friendly detection tools that provide an alternative to the microphone-based method.

### 7.1.11.1. Sensor features

Description: This sensor attaches to the neck and records vibration. The sensor converts snoring, and other sounds in the audio range picked up through the skin, to a small analog voltage that provides a clear, reliable indication of the presence of these sounds.



Figure: Snore Sensor

Sound is absorbed via vibrations from the throat and transferred to the device which is then converted into analog signal. So, the throat method eliminates most background noise whether in the battle field or on the job site.

Snore sensor maintains constant contact with the patient's skin throughout movements or sweating so that you will consistently receive quality signals throughout the night with little to no artifact.

Vibration-type sensor unit:

- 1. With pretty good anti-noise performance
- 2. Detachable acoustic tube design
- 3. Translucent earbud, better for personal hygiene and discreet measurement
- 4. Comfortable With high-quality flexible plastic clip
- 5. Easy to be fixed on your desired place
- 6. Suitable for MySignals Hardware double-jack connector
- 7. Adjustable to suits neck size between 12" and 15".
- 8. Small PTT button right on the neck piece used to generate alerts.

The sensor needs to be connected to the specific Snore double jack connector in MySignals device and it works with direct connector power supply.

#### **Measurement:**

Parameter	Unit	Range
Snore rate	SPM (Snores per minute)	0-60 spm
Snore signal	Volts	0-5V

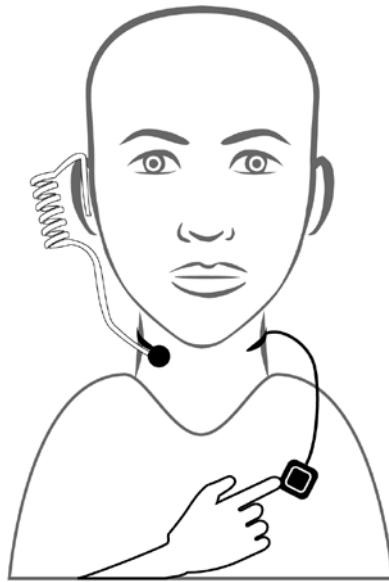
### 7.1.11.2. Connecting the sensor

Connect the sensor in the snore double connector indicated in the MySignals Hardware board. The sensor cable have only one way of connection to prevent errors and make the connection easier.



Figure: MySignals Software Development Platform with Snore connected

Place the sensor in your neck as you can see in the next image. You can use the translucent earbud speaker in your ear in order to detect acoustic alerts or messages.



After a few seconds you will get the values in the visualization method selected.

**NOTE:** Position the sensor in the correct position as you can see in the diagram connection, and wait 3-5 minutes in order to stabilize the sensor measure.

## 7.1.11.3. Examples of use

### Standalone Mode

This is an example of sensor measuring in Standalone Mode.

First of all select the sensor that you want to measure in the Select Sensors screen. Use the touchscreen pressing in the correct symbol. You can see the selected sensors logos in blue color.



Figure: Selected sensor logo

Then you can go to General Sensor screen using the left down corner logo. MySignals will start to monitor all the parameters in General Mode where it only show numeric values.



Figure: General mode and selecting general mode

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

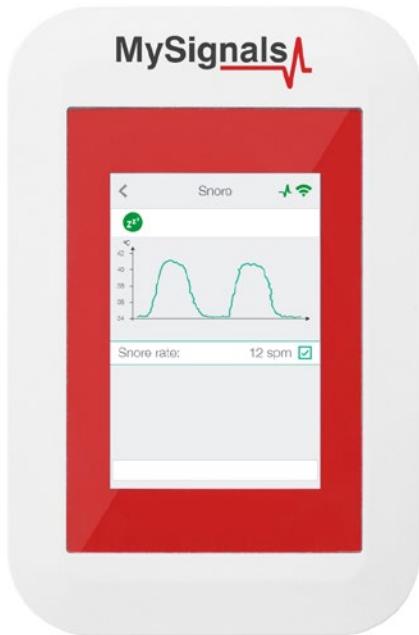


Figure: Detail mode

In September 2017 we have released new Firmware, Apps and Cloud versions that allow to record continuous waves and send them to record continuous waves and send them to the Cloud (in Server Mode). You can record 15 or 30 seconds of the data measured in detail mode of **ECG**, **EMG**, **Snore** and **Airflow**.



You can use this new function in Server Mode using detail mode. Use the **Record 15 seconds** or **Record 30 seconds** buttons in order to start a new record.

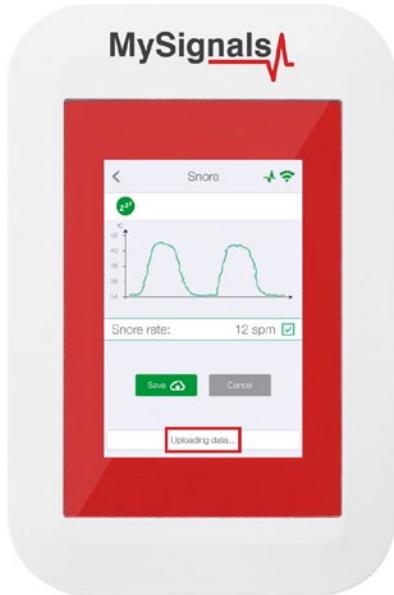
Note that you must use **View 15 seconds** or **View 30 seconds** buttons each time you want to see the wave in the screen.



With the record finished you can choose between saving this record in the cloud or cancel it.



You will see all the information about the upload to the cloud at the bottom of the screen (text message zone).



After a correct upload you will see the date of the file saved. Then you can see this new v data file in the Web Server or in the Mobile App.



## MySignals App

This is an example of sensor viewing in MySignals App Mode.

First of all select the sensor that you want to measure in the Select Sensors screen. Use your smartphone touchscreen pressing in the correct symbol. You can see the selected sensors logos in blue color.



Figure: Selected sensor logo App

Then you can go to General Sensor screen using the left down corner logo. MySignals will start to monitor all the parameters in General Mode where it only show numeric values.

You can see in this screen a color code in the sensor logos:

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previously connection of some time ago.
- Grey: It is that the sensor is not connected.

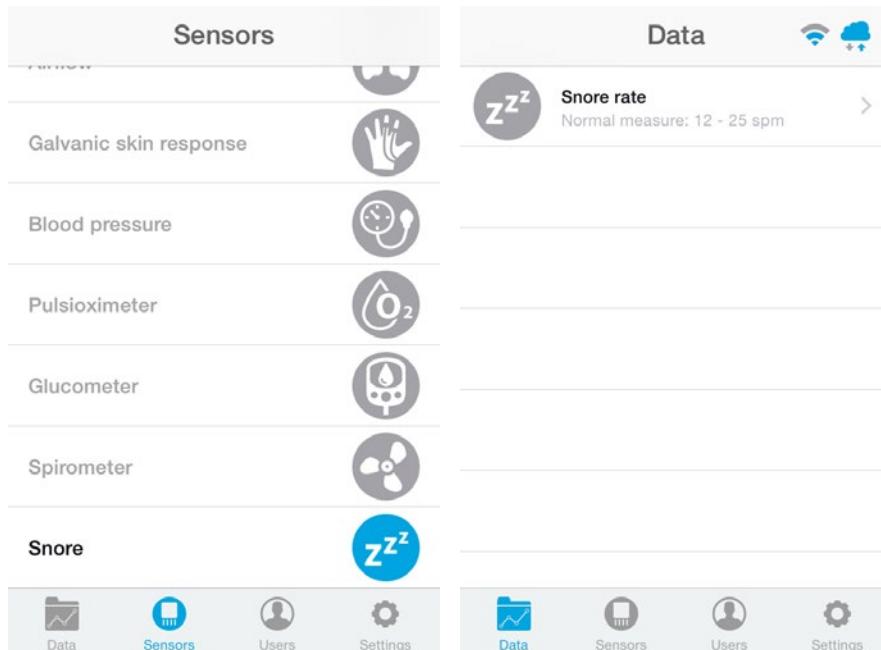


Figure: General mode and selecting general mode App

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

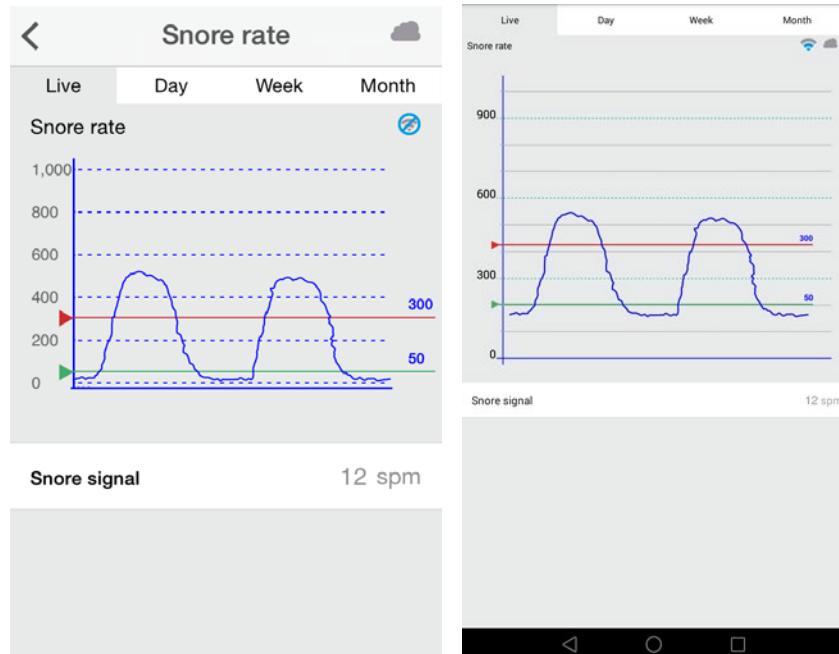
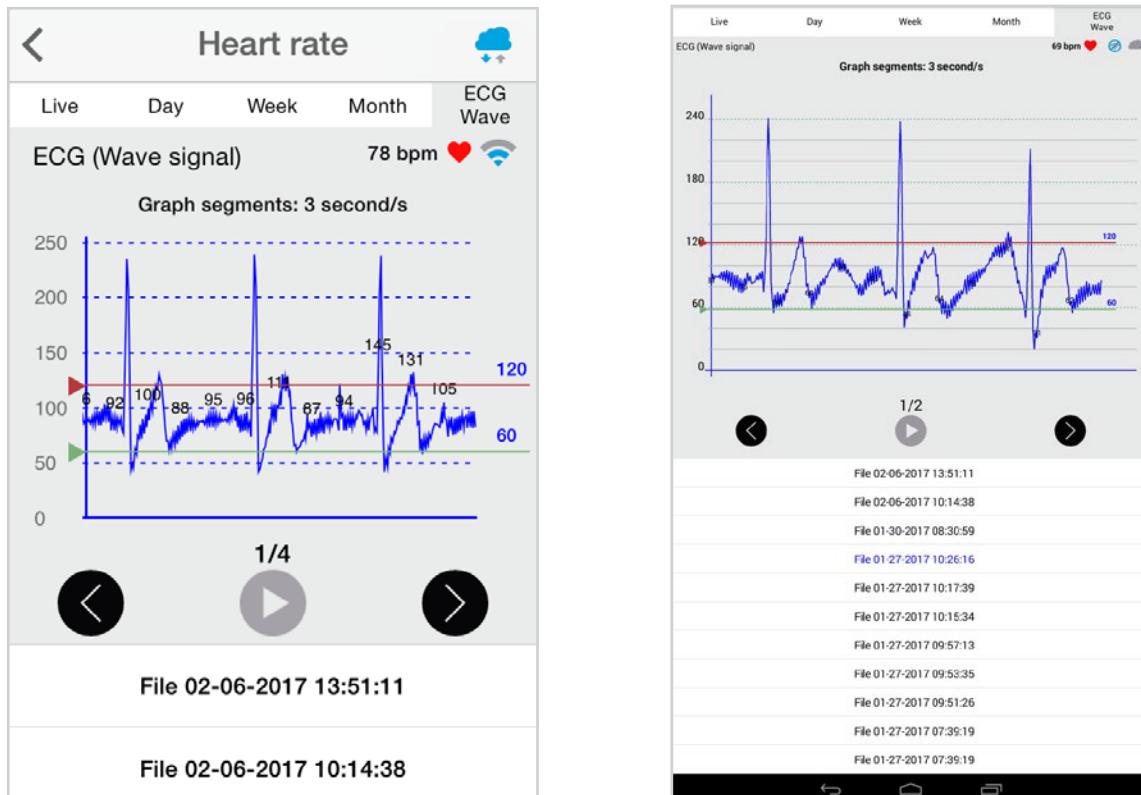


Figure: Detail mode

There is a new tab on detail screen for ECG, EMG, Airflow and Snore sensors. This tab allows the user to display raw data recorded from MySignals device (in Server Mode). You can record until 30 seconds from MySignals device and show the recorded data on raw data tab, this tab is placed on the top right of the screen.

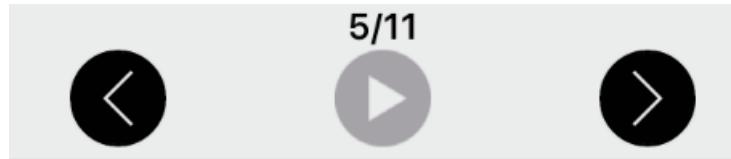
On top right, you can see the ECG rate, EMG rate, Airflow rate or Snore rate. Above the graph, you can see the graph time for X axis, in this case the graph was divided in windows of parts of 3 seconds each.



Over the graph you can notice the values for each important data peak, you can track wave changes by watching these values.

You can move the limits of the graph with the green and red lines, touch each line to move it along the graph view.

On bottom section from the graph view there are three buttons:



Right and left arrow buttons let you move the graph to right or left. In the middle position, there is a play/pause button to start or stop the carousel mode. By default and once the graph load ends, the graph animation plays automatically. For instance, if you record 30 seconds on MySignals device, the Application will show 11 parts to navigate using the left/right arrow buttons. Once the graph ends loading, the animation will play automatically.

Just above the play/pause button, you can see a little navigation legend to know which part of the full graph you are showing.

At the end of the screen you can get the list of MySignals recordings provided by the user from the device, this listing is shown in order from latest to oldest one, each row shows the recording date and time. Tap on one row to select a single recording and the mobile Application will start plotting the data on the graph, the row will be also highlighted to let the user know which row is currently plotting.

The listing rows have a sampling rate and it is about 10 milliseconds.

## MySignals Web Server

This is an example of sensor viewing in MySignals Web Server Mode.

First of all choose the sensor that you want to visualize. fast menu situated in the left side of the Web Server. Choose an user.

The screenshot shows the 'Account Settings' page of the MySignals Web Server. On the left, a sidebar lists categories: ORGANIZATION, CARDIOLOGY, DERMATOLOGY, TRAUMATOLOGY, DEVICES, and MEMBERS. The main content area has tabs for 'Account Settings', 'Usage', and 'Statistics'. Under 'Account Settings', it shows a profile picture, Name: Demo User (public), Email: [redacted], Sign up: 2018-02-07 08:53:00, Last update: 2018-02-07 08:56:17. Under 'Usage', it shows License Usage Time (0%), Database Storage (0 of 500000), and API Calls (0). A note says 'Your license has not API Cloud access' and 'License expires on: 2019/03/02'. Under 'Statistics', it shows Devices (5/1), Members (15/5), and Departments (3/1). The 'Usage by Member' section lists 15 members with 0 DB records each. At the bottom, a footer notes '© Libidum Comunicaciones Centrales S.L.'.

Figure: Select user

You can select an upload to the cloud time interval in WiFi setting of 10, 20, 30 or 60 seconds.

Then you can see the General Sensor page. MySignals Web Server will monitor all the parameters in General Mode where it only show numeric values.

You can see in this screen a color code in the sensor logos:

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previously connection of some time ago.
- Grey: It is that the sensor is not connected.

The screenshot shows the MySignals web interface in General mode. On the left, a sidebar lists categories like Organization, Cardiology, Dermatology, Traumatology, Devices, and Members. The main area displays a member profile for "Anna Gerhold" with details such as Name: Anna, Surname: Gerhold, Member ID: 25, Height: 173 cm, Weight: 104 kg, Birthday: 10 Jun 1987, and Department: Dermatology. Below this is a "Data" section listing various sensors with their normal ranges:

- Body position
- Temperature (Normal measure: 36 - 38 °C)
- Muscle contraction (cpm) (Normal measure: 0 - 10 cpm)
- Heart rate (bpm) (Normal measure: 60 - 120 bpm)
- Respiratory rate (ppm) (Normal measure: 12 - 25 ppm)
- Conductance (Normal measure: 2 - 7 µS)
- Diastolic pressure Systolic pressure (Normal measure: 40 - 80 mmHg / 80 - 120 mmHg)
- Oxygen saturation (Normal measure: 90 - 98 %)
- Glucose mg (Normal measure: 72 - 114 mg/dL)
- PEF FEV1 (Normal measure: 540 - 780 l/min / 180 - 300 l)
- Snore rate (spm) (Normal measure: 12 - 25 spm)
- Weight (Normal measure: 40 - 120 Kg)
- Diastolic pressure Systolic pressure (Normal measure: 40 - 80 mmHg / 80 - 120 mmHg)
- Oxygen saturation (Normal measure: 95 - 98 %)
- Glucose (Normal measure: 72 - 144 mg/dL)
- EEG Attention EEG Meditation (Normal measure: 30 - 50 % / 30 - 50 %)

Figure: General mode Web Server

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.



Figure: Detail mode Web Server

You can change the interval that configure MySignals to send data to the server. Introduce the value in seconds. MySignals will send data to the server as it is configured.

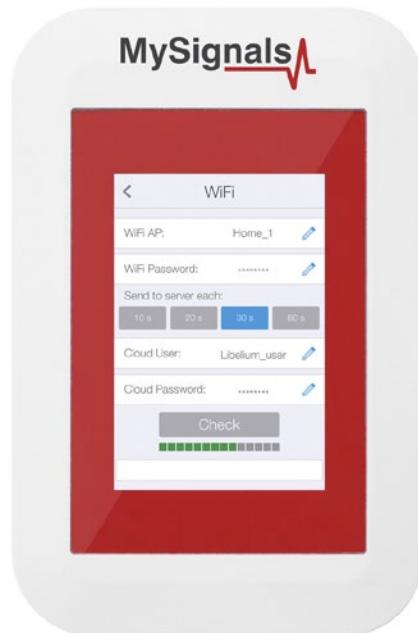


Figure: WiFi settings

## Raw data viewer

A new feature has been added allowing us to see the raw data, also known as wave signal, for the sensors: Airflow, ECG, EMG and Snore.

The screenshot shows the MySignals member detail page for a user named Esta Hane. The left sidebar includes sections for Organization, Cardiology (selected), Dermatology, Traumatology, Devices, and Members. The main content area is titled 'Member' and shows Esta's profile picture and basic information: Name: Esta, Surname: Hane, Member ID: 5, Last update: 2017-02-06 06:51:22-05:00. Below this is the 'Data' section, which lists various sensor readings with their normal ranges and a 'View' link. Red arrows point to the icons for Heart rate (bpm), Muscle contraction (cpm), Respiratory rate (ppm), and Snore rate (spm).

Sensor	Value	Normal Measure	Action
Body position	non-defined position		>
Temperature	25.73 °C	Normal measure: 36 - 38 °C	>
Muscle contraction	0 cpm	Normal measure: 0 - 10 cpm	>
Heart rate	106 bpm	Normal measure: 60 - 120 bpm	>
Respiratory rate	0 ppm	Normal measure: 12 - 25 ppm	>
Conductance	2764.87 µS	Normal measure: 2 - 7 µS	>
Diastolic pressure	Systolic pressure	Normal measure: 40 - 80 mmHg    80 - 120 mmHg	>
Oxygen saturation		Normal measure: 95 - 98 %	>
Glucose mg		Normal measure: 72 - 114 mg/dl	>
PEF	FEV1	Normal measure: 540 - 780 l/min    180 - 300 l	>
Snore rate	(spm)	Normal measure: 12 - 25 spm	>
Weight		Normal measure: 40 - 120 Kg	>
Diastolic pressure	Systolic pressure	Normal measure: 40 - 80 mmHg    80 - 120 mmHg	>
Oxygen saturation		Normal measure: 95 - 98 %	>
Glucose		Normal measure: 72 - 144 mg/dl	>
EEG Attention	EEG Meditation	Normal measure: 30 - 50 %    30 - 50 %	>

The member detail page shows a general view of the last values received for the different sensors.

Please select one of the following sensors in order to go to the sensor detail page:

- Airflow: (Respiratory rate)
- ECG: (Heart rate)
- EMG: (Muscle contraction)
- Snore: (Snore rate)



Once in this page click the 'Wave Signal' tab.

In the bottom right of the page there is a dropdown selector with the available raw values sorted by date. Select one of this an you will see the wave that was recorded using the MySignals hardware.



In the bottom center there is a pagination control that you can use for navigating the wave, going ahead and backwards in the timeline.



In the bottom left part of the page it's displayed the average value for bpm, ppm, cpm or spm for the entire period of the wave recorded.



## 7.2. Wireless Sensors (BLE)

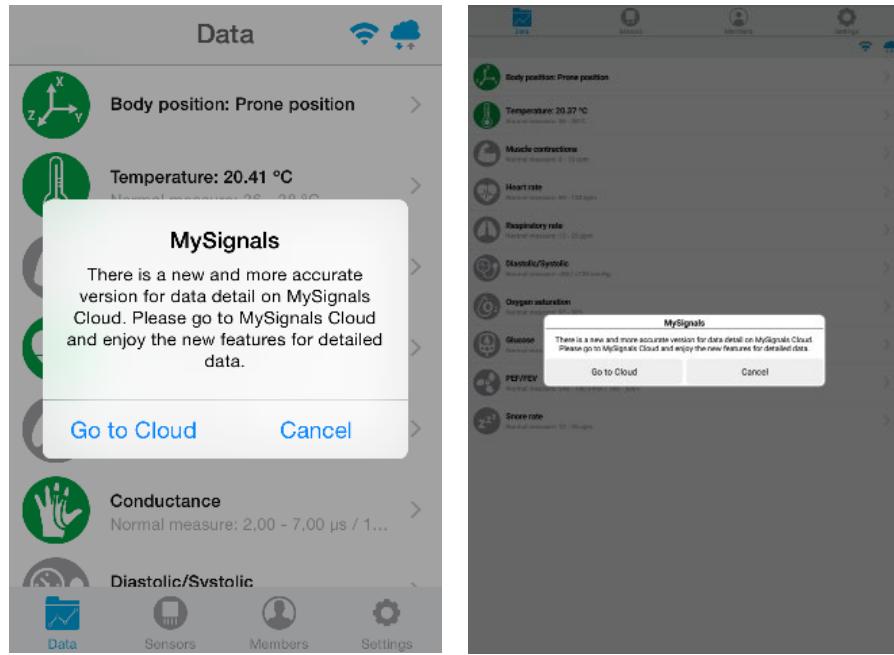
MySignals Hardware Development Platform can work with 4 different wireless biometric sensors using BLE connectivity.

- MySignals Glucometer (BLE)
- MySignals Blood pressure monitor (BLE)
- MySignals Pulsioximeter SPO2 (BLE)
- MySignals Scale (BLE)
- Alarm button (BLE)



Figure: MySignals Hardware Development Platform with Wireless Sensors

**NOTE:** All detail screen for sensors on Mobile applications were replaced for a completely new web detail on MySignals Cloud, if you click onto a sensor in iPhone or Android application you will get a popup message pointing the new MySignals Cloud, there you can enjoy the new features for each sensor detail.



## 7.2.1. Body Scale (BLE)

Weighing scales (or weigh scales or scales) are devices to measure weight or calculate mass. Spring balances or spring scales measure weight (force) by balancing the force due to gravity against the force on a spring, whereas a balance or pair of scales using a balance beam compares masses by balancing the weight due to the mass of an object against the weight of a known mass or masses.

### 7.2.1.1. Sensor features

**Description:** Multipurpose personal portable digital weight health body scale.

Monitor your body weight like never before with a digital wireless body fat monitor. This bathroom scale uses a BLE connection to sync your weight, BMI, and body fat readings with your personal health dashboard.



Figure: Body Scale sensor

- Max Capacity : 150kg/330lb
- Display Readability : 0.1kg/0.2lb
- Weighing Units : kg. lb. st
- Platform : Tempered Glass + 18/8 SS
- LED Display

This sensor uses 4 AA batteries.

#### Measurement:

Parameter	Unit	Range
Weight	Kilograms	5-150Kg
Bone	Percentage	0-100%
Body fat	Percentage	0-100%
Muscle mass	Percentage	0-100%
Body water	Percentage	0-100%
Visceral fat	Percentage	0-100%
BMI	Kcal	0-500Kcal
BMR	Kcal	0-500Kcal

### 7.2.1.2. Connecting the sensor

This sensor have not cable. This sensor send the data wireless to MySignals board.

- The device is designed to allow auto step on. The first time you use the scale please ignore the initial reading as this may reflect the factory settings. The scale will be accurate as of the second use.
- For better results, always remove your shoes and socks.
- It is advisable to always take measurement at the same time of the day.
- Readings can be misleading after intensive exercise, excessive dieting or under extreme dehydration.
- Always weigh/use the scale on a hard and flat surface.
- For children under 10 or adults over 100, the scale can only be used in regular weighing mode.
- For adults over 70, body builders or people with extreme fitness levels, there may be deviations in the measured data

This scale is available in kg or lb. You can set to the one you prefer by pressing the unit

Conversion button on the back of the scale (picture shown on the left). Press the unit conversion button when scale is powered off. LCD shows current weight unit. Press the button again to convert to another weight unit.



Figure: Configuration button

It is really important to remove your shoes and socks before stepping on the scale especially when you are using the scale in body analysis weighing mode. Assure that your feet are well positioned on the metallic sensors, otherwise the scale will not be able to determine your body composition.



Figure: MySignals Software Development Platform with Body Scale starting the measure

The sensor will begin to make a measurement. In order to measure correctly is important to maintain body in the correct position.

Wait until MySignals program indicate that it is connected with the BLE sensor.



Figure: Body Scale measure finished

Do not make abrupt movements or the measure will be not reliable.

The Body Scale will take a few moments to calculate the human body reading and send them wireless.



Figure: MySignals Hardware Development Platform with Body Scale situated in the user body

After a few seconds you will get the values in the visualization method programmed.

## Setting personal parameters

The first time you turn on your scale, it have defined default parameters (Gender, Height, Age...).

Parameters can be set using MySignals App.

## 7.2.1.3. Examples of use

### Standalone Mode

This is an example of sensor measuring in Standalone Mode.

First of all select the sensor that you want to measure in the Select Sensors screen. Use the touchscreen pressing in the correct simbol. You can see the selected sensors logos in blue color.



Figure: Selected sensor logo

Then you can go to General Sensor screen using the left down corner logo. MySignals will start to monitor all the parameters in General Mode where it only show numeric values.



Figure: General mode and selecting general mode

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

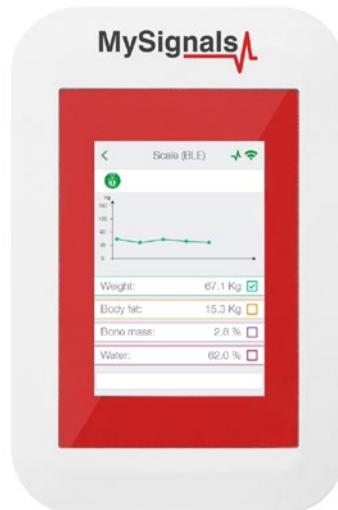


Figure: Detail mode

## MySignals Web Server

This is an example of sensor viewing in MySignals Web Server Mode.

First of all choose the sensor that you want to visualize. You can use the fast menu situated in the left side of the Web Server. Choose an user.

The screenshot shows the MySignals Web Server interface. On the left, there is a sidebar with a red heart icon and a list of categories: ORGANIZATION, CARDIOLOGY, DERMATOLOGY, NEUROLOGY, DEVICES, and MEMBERS. The main content area has a header "MySignals DEMO MODE".

- Account Settings:** Shows a profile picture of a man, Name: Demo User (public), Email: [redacted], Sign up: 2018-02-07 08:53:06, Last update: 2018-02-07 08:56:17. A "Edit" button is at the bottom right.
- Usage:** Includes sections for License Usage Time (1 day), Database Storage (0 of 50000), and API Calls (Your license has not API Cloud access). It also shows a note about the license expiring on 2018-03-07.
- Statistics:** Shows counts for Devices (5/1), Members (15/5), and Departments (3/1).
- Usage by Member:** A table listing members with their profile pictures, member names, DB records (%), DB records, and Action buttons. All members listed have 0 DB records.

Figure: Select user

You can select an upload to the cloud time interval in WiFi setting of 10, 20, 30 or 60 seconds.

Then you can see the General Sensor page. MySignals Web Server will monitor all the parameters in General Mode where it only show numeric values.

You can see in this screen a color code in the sensor logos:

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previously connection of some time ago.
- Grey: It is that the sensor is not connected.

The screenshot shows the 'Member' section of the MySignals web server. On the left, there's a sidebar with navigation links for Organization, Cardiology, Dermatology, Traumatology, Devices, and Members. A profile picture of Anna Gerhold is displayed. Below her name, there are fields for Name (Anna), Surname (Gerhold), Member ID (25), Height (173 cm), Weight (104 kg), Birthday (10 Jun 1987), and Department (Dermatology). The main area is titled 'Data' and lists various sensors with their normal ranges:

- Body position:** Normal measure: 2 - 7 µs
- Temperature:** Normal measure: 36 - 38 °C
- Muscle contraction (cpm):** Normal measure: 0 - 10 cpm
- Heart rate (bpm):** Normal measure: 60 - 120 bpm
- Respiratory rate (ppm):** Normal measure: 12 - 25 ppm
- Conductance:** Normal measure: 2 - 7 µs
- Diastolic pressure / Systolic pressure:** Normal measure: 40 - 80 mmHg / 80 - 120 mmHg
- Oxygen saturation:** Normal measure: 95 - 98 %
- Glucose mg:** Normal measure: 72 - 144 mg/dl
- PEF / FEV1:** Normal measure: 540 - 780 l/min / 180 - 300 l
- Snores rate (spm):** Normal measure: 12 - 25 spm
- Weight:** Normal measure: 40 - 120 kg
- Diastolic pressure / Systolic pressure:** Normal measure: 40 - 80 mmHg / 80 - 120 mmHg
- Oxygen saturation:** Normal measure: 95 - 98 %
- Glucose:** Normal measure: 72 - 144 mg/dl
- EEG Attention / EEG Meditation:** Normal measure: 30 - 50 % / 30 - 50 %

Figure: General mode Web Server

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

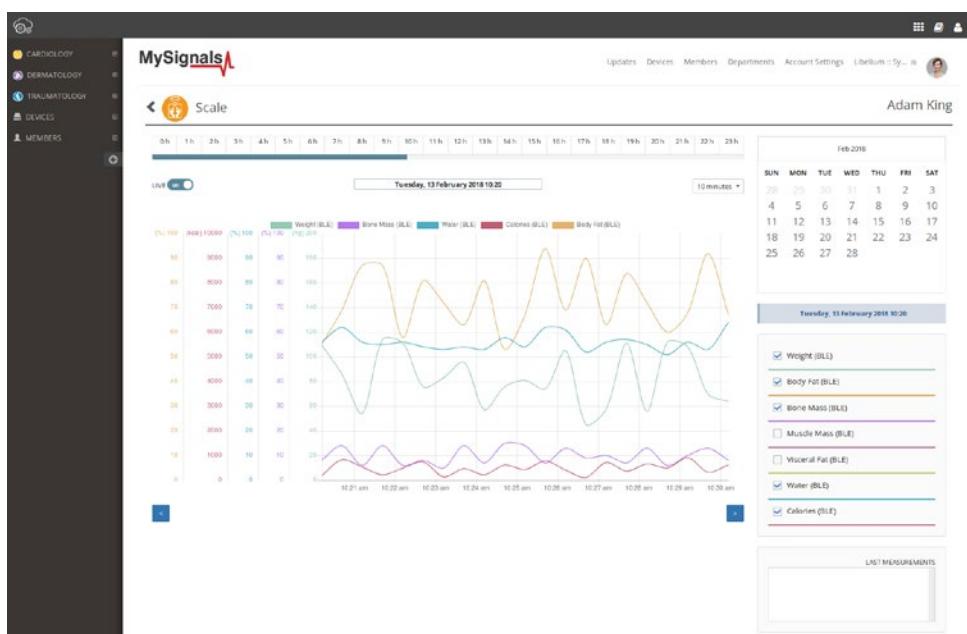


Figure: Detail mode Web Server

You can change the interval that configure MySignals to send data to the server. Introduce the value in seconds. MySignals will send data to the server as it is configured.

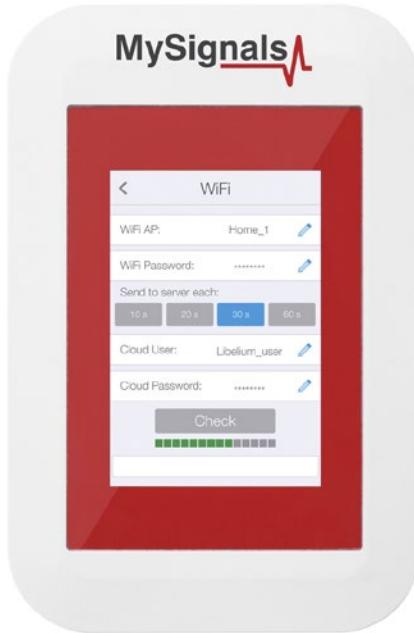


Figure: WiFi settings

## 7.2.2. Pulse and Oxygen in Blood SPO2 (BLE)

### 7.2.2.1. Sensor features

**Description:** Pulse oximetry a noninvasive method of indicating the arterial oxygen saturation of functional hemoglobin.

Oxygen saturation is defined as the measurement of the amount of oxygen dissolved in blood, based on the detection of Hemoglobin and Deoxyhemoglobin. Two different light wavelengths are used to measure the actual difference in the absorption spectra of HbO<sub>2</sub> and Hb. The bloodstream is affected by the concentration of HbO<sub>2</sub> and Hb, and their absorption coefficients are measured using two wavelengths 660 nm (red light spectra) and 940 nm (infrared light spectra). Deoxygenated and oxygenated hemoglobin absorb different wavelengths.



Figure: Pulse and Oxygen in Blood (SPO2)

Deoxygenated hemoglobin (Hb) has a higher absorption at 660 nm and oxygenated hemoglobin (HbO<sub>2</sub>) has a higher absorption at 940 nm . Then a photo-detector perceives the non-absorbed light from the LEDs to calculate the arterial oxygen saturation.

A pulse oximeter sensor is useful in any setting where a patient's oxygenation is unstable, including intensive care, operating, recovery, emergency and hospital ward settings, pilots in unpressurized aircraft, for assessment of any patient's oxygenation, and determining the effectiveness of or need for supplemental oxygen.

Acceptable normal ranges for patients are from 95 to 99 percent, those with a hypoxic drive problem would expect values to be between 88 to 94 percent, values of 100 percent can indicate carbon monoxide poisoning.

This sensor uses 2 AAA batteries.

Parameter	Unit	Range
Pulse	ppm	25-50 ppm
SPO2	%	35-100%

### 7.2.2.2. Connecting the sensor

This sensor have not cable. This sensor send the data wireless to MySignals board.

Place the SPO2 on your finger as shown in the image below.



Figure: SPO2 connection diagram

Turn on the SPO2 (press ON button). The sensor will begin to make a measurement. In order to measure correctly is important to maintain finger in the correct position.

Wait until MySignals program indicate that it is connected with the BLE sensor.



Figure: SPO2 sensor ON button

Do not make abrupt movements or the measure will be not reliable.

The SPO2 will take a few moments to calculate the pulsioximeter reading and send them wireless.



Figure: MySignals Hardware Development Platform with SPO2 situated in the user body

After a few seconds you will get the values in the visualization method programmed.

### 7.2.2.3. Examples of use

## Standalone Mode

This is an example of sensor measuring in Standalone Mode.

First of all select the sensor that you want to measure in the Select Sensors screen. Use the touchscreen pressing in the correct symbol. You can see the selected sensors logos in blue color.



*Figure: Selected sensor logo*

Then you can go to General Sensor screen using the left down corner logo. MySignals will start to monitor all the parameters in General Mode where it only show numeric values.



*Figure: General mode and selecting general mode*

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.



*Figure: Detail mode*

## MySignals Web Server

This is an example of sensor viewing in MySignals Web Server Mode.

First of all choose the sensor that you want to visualize. You can use the fast menu situated in the left side of the Web Server. Choose an user.

The screenshot shows the 'Account Settings' page of the MySignals Web Server. On the left, there's a sidebar with a tree view of organization structure: ORGANIZATION, CHIROLOGY, HEMATOLOGY, DERMATOLOGY, TRAUMATOLOGY, DEVICES, and MEMBERS. The main content area has tabs for 'Account Settings', 'Usage', and 'Statistics'. Under 'Account Settings', it shows the user 'Demo User (public)' with email '\*\*\*\*\*', sign-up date '2018-02-07 08:53:06', and last update '2018-02-07 08:56:17'. The 'Usage' tab displays license usage time (0h 0m), database storage (0 of 500000), and API calls (0). The 'Statistics' tab shows device count (5/1), member count (15/5), and department count (3/1). The 'Usage by Member' section lists 15 members with their names and corresponding DB records (all 0). At the bottom, a footer note says '© Libellum Communications Distr. Bulgaria S.L.'.

Figure: Select user

Then you can see the General Sensor page. MySignals Web Server will monitor all the parameters in General Mode where it only show numeric values.

You can select an upload to the cloud time interval in WiFi setting of 10, 20, 30 or 60 seconds.

You can see in this screen a color code in the sensor logos:

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previous connection of some time ago.
- Grey: It is that the sensor is not connected.

The screenshot shows the MySignals web interface. On the left is a dark sidebar with a tree view of organization branches: Organization, Cardiology, Dermatology, Traumatology, Devices, and Members. The Members branch is expanded, showing users Anna Gerhold, Brady Rules, Jody Goldner, Lauren Konope, and Shana Tarcott. The main content area has a header "Member" with a profile picture of Anna Gerhold. Below this is a table with her details: Name (Anna), Surname (Gerhold), Member ID (29), Last update (not shown), Height (173 cm), Weight (104 kg), Birthday (10 Jun 1987), and Department (Dermatology). A section titled "Data" follows, listing various sensors with their normal ranges and current values. Most values are green, indicating real-time measurement. Some are orange, indicating old values. Grey icons represent sensors not connected. Examples include Body position, Temperature (Normal range 36 - 38 °C), Muscle contraction (Normal range 0 - 10 cpm), Heart rate (Normal range 60 - 120 bpm), Respiratory rate (Normal range 12 - 25 ppm), Conductance (Normal range 2 - 7 µs), Diastolic pressure / Systolic pressure (Normal range 40 - 80 mmHg / 80 - 120 mmHg), Oxygen saturation (Normal range 95 - 98 %), Glucose mg (Normal range 72 - 114 mg/dL), PEF / FEV1 (Normal range 540 - 780 l/min / 180 - 300 l), Snore rate (Normal range 12 - 25 ppm), Weight (Normal range 40 - 120 kg), Diastolic pressure / Systolic pressure (Normal range 40 - 80 mmHg / 80 - 120 mmHg), Oxygen saturation (Normal range 95 - 98 %), Glucose (Normal range 72 - 144 mg/dL), and EEG Attention / EEG Meditation (Normal range 30 - 50 % / 30 - 50 %).

Figure: General mode Web Server

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

The screenshot shows the MySignals web interface in Demo Mode. The sidebar is identical to the previous screenshot. The main content area has a header "Pulsioximeter" with a profile picture of Jacinthe Aufderhar. Below this is a "LIVE" button, a date and time indicator (Wednesday, 7 February 2018 13:42), and a "12 minutes" dropdown. A large graph displays two data series: Oxygen Saturation (blue line) and Heart Rate (orange line). The Y-axis for Oxygen Saturation ranges from 80 to 100, and the X-axis shows time intervals from 1:40 pm to 1:52 pm. The Y-axis for Heart Rate ranges from 60 to 140, and the X-axis shows time intervals from 1:40 pm to 1:52 pm. To the right of the graph is a calendar for February 2018 and a "LAST MEASUREMENTS" section. At the bottom of the graph area are two checkboxes: "Oxygen Saturation (BLF)" and "Heart Rate (BLF)". The footer contains the text "© Ubiform Comunicaciones, SRL Uruguay S.R.L." and a small logo.

Figure: Detail mode Web Server

## 7.2.3. Blood Pressure Monitor (BLE)

Blood pressure is the pressure of the blood in the arteries as it is pumped around the body by the heart. When your heart beats, it contracts and pushes blood through the arteries to the rest of your body. This force creates pressure on the arteries. Blood pressure is recorded as two numbers—the systolic pressure (as the heart beats) over the diastolic pressure (as the heart relaxes between beats).

### 7.2.3.1. Sensor features

**Description:** Monitoring blood pressure at home is important for many people, especially if you have high blood pressure. Blood pressure does not stay the same all the time. It changes to meet your body's needs. It is affected by various factors including body position, breathing or emotional state, exercise and sleep. It is best to measure blood pressure when you are relaxed and sitting or lying down.



Figure: Blood Pressure sensor

#### Classification of blood pressure for adults (18 years and older)

High blood pressure (hypertension) can lead to serious problems like heart attack, stroke or kidney disease. High blood pressure usually does not have any symptoms, so you need to have your blood pressure checked regularly.

#### SPECIAL FEATURES:

- Automatic measurement of systolic, diastolic and pulse
- 80 measurement results with time & date stored in the device

## KEY SPECIFICATIONS

- Measurement method: Oscillometric system
- Measuring range: Pressure 0-300 mmHg
- Pulse: 30~200 p/min
- Measuring accuracy: Pressure  $\leq \pm 3$  mmHg
- Pulse:  $\leq 5\%$
- Operating environment: Temperature: 10-40°C
- Relative humidity:  $\leq 80\%$

The sensor works with internal rechargeable battery. Use the Blood pressure specific cable in order to charge the sensor connected to MySignals.



Figure: Blood Pressure sensor with charger cable connected

### Measurement:

Parameter	Unit	Range
Systolic pressure	mm Hg	0-300 mm Hg
Diastolic pressure	mm Hg	0-300 mm Hg
Pulse	ppm	30-200ppm

### 7.2.3.2. Connecting the sensor

#### Connecting the sensor

This sensor have not cable. This sensor send the data wireless to MySignals board.

Place the sphygmomanometer on your arm (biceps zone) as shown in the image below.



Figure: Blood Pressure connection diagram

Turn on the sphygmomanometer cuff (press ON button). The sensor will begin to make a measurement. In order to measure correctly is important to maintain the arm and the cuff in the correct position.

Wait until MySignals program indicate that it is connected with the BLE sensor.



Figure: Blood Pressure sensor ON button

Do not make abrupt movements or the measure will be not reliable.

The sphygmomanometer will take a few moments to calculate the blood pressure reading and send them wireless.



*Figure: MySignals Hardware Development Platform with Blood Pressure situated in the user body*

After a few seconds you will get the values in the visualization method programmed.

## 7.2.3.3. Examples of use

### Standalone Mode

This is an example of sensor measuring in Standalone Mode.

First of all select the sensor that you want to measure in the Select Sensors screen. Use the touchscreen pressing in the correct simbol. You can see the selected sensors logos in blue color.



Figure: Selected sensor logo

Then you can go to General Sensor screen using the left down corner logo. MySignals will start to monitor all the parameters in General Mode where it only show numeric values.



Figure: General mode and selecting general mode

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

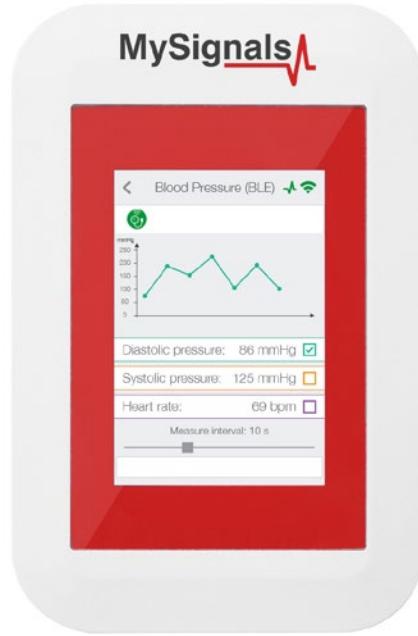


Figure: Detail mode

In detail mode of blood pressure sensor and blood pressure BLE sensor, you can use the measure interval of time in order to configure the time between each measure. '0' indicates that MySignals powers off the sensor after each measurement.



Figure: Blood pressure sensors detail view

## MySignals Web Server

This is an example of sensor viewing in MySignals Web Server Mode.

First of all choose the sensor that you want to visualize. You can use the fast menu situated in the left side of the Web Server. Choose an user.

The screenshot shows the 'Account Settings' page for a user named 'Demo User (public)'. The top navigation bar includes links for Updates, Devices, Members, Departments, Account Settings (which is active), Demo User (public), and a profile icon. The main content area is divided into sections: 'Usage' (License Usage Time, Database Storage, API Calls), 'Statistics' (Devices 5/1, Members 15/5, Departments 3/1), and 'Usage by Member' (a table listing 15 members with their names and profile icons). The sidebar on the left lists organizational categories: ORGANIZATION, CARDIOLOGY, HEMATOLOGY, DERMATOLOGY, TRAUMATOLOGY, DEVICES, and MEMBERS.

Member	DB records (%)	DB records	Action
Adeline Ullrich		0	
Amelie Nicolas		0	
Burnice McGlynn		0	
Clifton Marks		0	
Daryl Harvey		0	
Jacinthe Audehrar		0	
Jonathan Watsica		0	
Kelly Schmitt		0	
Kyle Monte		0	
Laisha Hintz		0	
Lourdes Gusikowski		0	
Novelia Bechtelar		0	
Oliver Chriancasen		0	
Rossie Wolf		0	
Sasha Zboncak		0	

Figure: Select user

You can select an upload to the cloud time interval in WiFi setting of 10, 20, 30 or 60 seconds.

Then you can see the General Sensor page. MySignals Web Server will monitor all the parameters in General Mode where it only show numeric values.

You can see in this screen a color code in the sensor logos:

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previously connection of some time ago.
- Grey: It is that the sensor is not connected.

The screenshot shows the MySignals web interface. On the left is a sidebar with categories: ORGANIZATION, CARDIOLOGY, DERMATOLOGY, TRAUMATOLOGY, DEVICES, and MEMBERS. Under MEMBERS, there is a list of users: Anna Gerhold, Brady Kules, Judy Goldner, Lauren Kompe, and Shana Turcott. The main content area has a header "Member" with a profile picture of Anna Gerhold. Below this is a table with her details: Name (Anna), Surname (Gerhold), Member ID (25), Last update (not shown), Height (173 cm), Weight (104 kg), Birthday (10 Jun 1987), and Department (Dermatology). A section titled "Data" lists various sensors with their normal ranges and current values. Most icons are grey, indicating they are not connected or are old values. Some are orange, indicating real-time values.

Name	Value	Normal Range
Body position		
Temperature	39 - 38 °C	Normal range: 39 - 38 °C
Muscle contraction (cpm)	0 - 10 cpm	Normal range: 0 - 10 cpm
Heart rate (bpm)	60 - 120 bpm	Normal range: 60 - 120 bpm
Respiratory rate (ppm)	12 - 25 ppm	Normal range: 12 - 25 ppm
Conductance	2 - 7 µS	Normal range: 2 - 7 µS
Diastolic pressure	80 mmHg	Normal range: 40 - 80 mmHg
Systolic pressure	120 mmHg	Normal range: 80 - 120 mmHg
Oxygen saturation	95 - 98 %	Normal range: 95 - 98 %
Glucose mg	114 mg/dl	Normal range: 72 - 114 mg/dl
PEF / FEV1	180 - 300 l/min	Normal range: 540 - 780 l/min
Snore rate (spm)	12 - 25 spm	Normal range: 12 - 25 spm
Weight	100 kg	Normal range: 40 - 120 kg
Diastolic pressure	80 mmHg	Normal range: 40 - 80 mmHg
Systolic pressure	120 mmHg	Normal range: 80 - 120 mmHg
Oxygen saturation	95 - 98 %	Normal range: 95 - 98 %
Glucose	144 mg/dl	Normal range: 72 - 144 mg/dl
EEG Attention	30 - 50 %	Normal range: 30 - 50 %
EEG Meditation	30 - 50 %	Normal range: 30 - 50 %

Figure: General mode Web Server

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

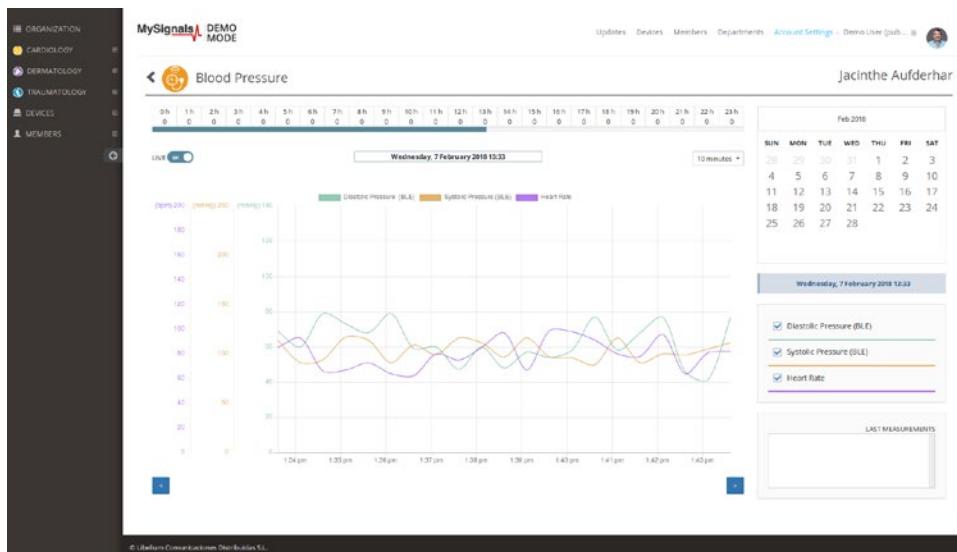


Figure: Detail mode Web Server

You can change the interval that configure MySignals to send data to the server. Introduce the value in seconds. MySignals will send data to the server as it is configured.

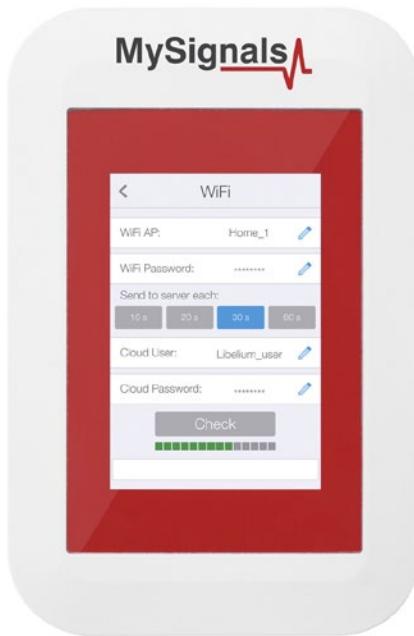


Figure: WiFi settings

## 7.2.4. Glucometer (BLE)

Despite widely variable intervals between meals or the occasional consumption of meals with a substantial carbohydrate load, human blood glucose levels tend to remain within the normal range. However, shortly after eating, the blood glucose level may rise, in non-diabetics, temporarily up to 7.8 mmol/L (140 mg/dL) or a bit more.

### 7.2.4.1. Sensor features

**Description:** Glucometer is a medical device for determining the Approximate concentration of glucose in the blood. A small drop of blood, obtained by pricking the skin with a lancet, is placed on a disposable test strip that the meter reads and uses to calculate the blood glucose level. The meter then displays the level in mg/dl or mmol/l.



Figure: Glucometer sensor

This sensor uses 2 AAA batteries.

### 7.2.4.2. Connecting the sensor

This sensor have not cable. This sensor send the data wireless to MySignals board.

Place a test strip in the machine when the machine is ready. Watch the indicator for placing the blood to the strip. Once the test strip package is opened, it must be consumed within 3 months.



Figure: Insert strip in the glucometer.

Wait until MySignals program indicate that it is connected with the BLE sensor.



Figure: Ready for measurement glucometer

Clean the end of your index finger with rubbing alcohol before pricking it with an sterile needle or lancet.

**NOTE:** The needles or lancets are not provided.



Figure: Lancet glucometer method 1

Pierce your finger tip on the soft, fleshy pad and obtain a drop of blood. The type of drop of blood is determined by the type of strip you are using



Figure: Lancet glucometer method 2

Place the drop of blood on or at the side of the strip.



Figure: Drop glucometer method 1



Figure: Drop glucometer method 2

The glucometer will take a few moments to calculate the blood sugar reading.



Figure: Glucometer measure

The glucometer send wireless the value to MySignals.



Figure: Diagram connection

When the glucometer send all the information, turn off the device.

## 7.2.4.3. Examples of use

### Standalone Mode

This is an example of sensor measuring in Standalone Mode.

First of all select the sensor that you want to measure in the Select Sensors screen. Use the touchscreen pressing in the correct symbol. You can see the selected sensors logos in blue color.



Figure: Selected sensor logo

Then you can go to General Sensor screen using the left down corner logo. MySignals will start to monitor all the parameters in General Mode where it only show numeric values.



Figure: General mode and selecting general mode

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.



Figure: Detail mode

## MySignals Web Server

This is an example of sensor viewing in MySignals Web Server Mode.

First of all choose the sensor that you want to visualize. You can use the fast menu situated in the left side of the Web Server. Choose an user.

The screenshot shows the MySignals Web Server interface. On the left, a sidebar lists categories: ORGANIZATION, CARDIOLOGY, DERMATOLOGY, TRAUMATOLOGY, DEVICES, and MEMBERS. The main content area is titled "Account Settings". It displays a profile picture of a man, the name "Demo User (public)", and the email "\*\*\*\*\*". It also shows the sign-up date (2018-02-07 08:53:06) and last update (2018-02-07 08:56:17). Below this are sections for "Usage" (License Usage Time, Database Storage), "Statistics" (Devices 5/1, Members 15/5, Departments 3/1), and "Usage by Member" (a table listing 15 members with 0 DB records each). At the bottom, a footer notes "© Bellion Communications Diagnostics S.L."

Member	DB records (%)	DB records	Action
Adeline Ulrich		0	
Amelie Nicolas		0	
Burnice McGlynn		0	
Clifton Marks		0	
Daryl Harvey		0	
Jacintha Aufderhar		0	
Jonathonen Watsica		0	
Kelly Schmitt		0	
Kyle Manzo		0	
Laisha Hertz		0	
Lourdes Grulikowski		0	
Novella Bechtar		0	
Oliver Christiansen		0	
Rossie Wolf		0	
Sasha Zboncak		0	

Figure: Select user

You can select an upload cloud time interval in WiFi setting of 10, 20, 30 or 60 seconds.

Then you can see the General Sensor page. MySignals Web Server will monitor all the parameters in General Mode where it only show numeric values.

You can see in this screen a color code in the sensor logos:

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previously connection of some time ago.
- Grey: It is that the sensor is not connected.

The screenshot shows the 'Member' section of the MySignals Web Server. At the top, there's a sidebar with organization categories like CARDIOLOGY, DERMATOLOGY, TRAUMATOLOGY, DEVICES, and MEMBERS. Below that is a list of members: Anna Gerhold, Brady Rules, Jody Goldner, Lauren Koncept, and Shana Turcotte. The main area displays member details for Anna Gerhold: Name (Anna), Surname (Gerhold), Member ID (25), Last update (not shown), Height (173 cm), Weight (104 kg), Birthday (10 Jun 1987), and Department (Dermatology). Below this is a 'Data' section listing various sensors with their normal ranges:

- Body position
- Temperature (Normal range: 36 - 38 °C)
- Muscle contraction (cpm) (Normal range: 0 - 15 cpm)
- Heart rate (bpm) (Normal range: 60 - 120 bpm)
- Respiratory rate (ppm) (Normal range: 12 - 25 ppm)
- Conductance (Normal range: 2 - 7 µS)
- Diastolic pressure Systolic pressure (Normal range: 40 - 80 mmHg | 80 - 120 mmHg)
- Oxygen saturation (Normal range: 95 - 98 %)
- Glucose mg (Normal range: 72 - 114 mg/dL)
- PEF FEV1 (Normal range: 540 - 780 L/min | 180 - 300 L)
- Snooze rate (spm) (Normal range: 12 - 25 spm)
- Weight (Normal range: 40 - 120 kg)
- Diastolic pressure Systolic pressure (Normal range: 40 - 80 mmHg | 80 - 120 mmHg)
- Oxygen saturation (Normal range: 95 - 98 %)
- Glucose (Normal range: 72 - 144 mg/dL)
- EEG Attention EEG Meditation (Normal range: 30 - 50 % | 30 - 50 %)

Figure: General mode Web Server

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.



Figure: Detail mode Web Server

You can change the interval that configure MySignals to send data to the server. Introduce the value in seconds. MySignals will send data to the server as it is configured.

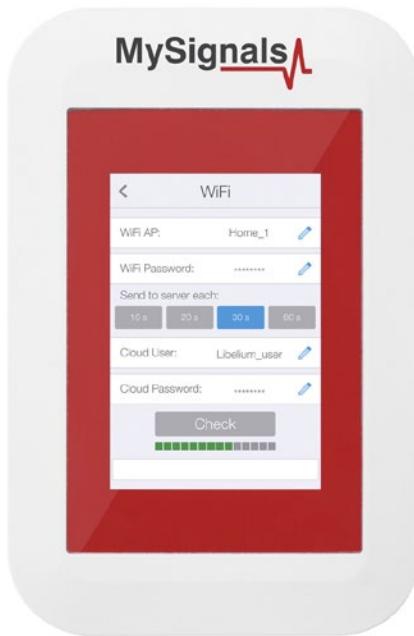


Figure: WiFi settings

## 7.2.5. Body temperature (BLE) [not available since May 2019]

Body temperature depends upon the place in the body at which the measurement is made, and the time of day and level of activity of the person. Different parts of the body have different temperatures. The commonly accepted average core body temperature (taken internally) is 37.0°C (98.6°F). In healthy adults, body temperature fluctuates about 0.5°C (0.9°F) throughout the day, with lower temperatures in the morning and higher temperatures in the late afternoon and evening, as the body's needs and activities change.

### 7.2.5.1. Sensor features

It is of great medical importance to measure body temperature. The reason is that a number of diseases are accompanied by characteristic changes in body temperature. Likewise, the course of certain diseases can be monitored by measuring body temperature, and the efficiency of a treatment initiated can be evaluated by the physician.



Figure: Body Temperature BLE sensor

- **Hypothermia** <35.0 °C (95.0 °F)
- **Normal** 36.5–37.5 °C (97.7–99.5 °F)
- **Fever or Hyperthermia** >37.5–38.3 °C (99.5–100.9 °F)
- **Hyperpyrexia** >40.0–41.5 °C (104–106.7 °F)

This sensor uses 1 CR1632 button cell.

#### Measurement:

Parameter	Unit	Range
Body Temperature	Degree Celsius (°C)	0-50°C

## 7.2.5.2. Connecting the sensor

This sensor have not cable. This sensor send the data wireless to MySignals board. Power on the module using the button.



Figure: Body Temperature BLE sensor ON button

The sensor will begin to make a measurement. Wait until MySignals program indicate that it is connected with the BLE sensor.



Figure: Body Temperature BLE sensor connection

Place the sensor on your body making contact between the metallic part and your skin as shown in the image below. There are several options available in order to situate the sensor to the body, you can use MySignals armband for this.

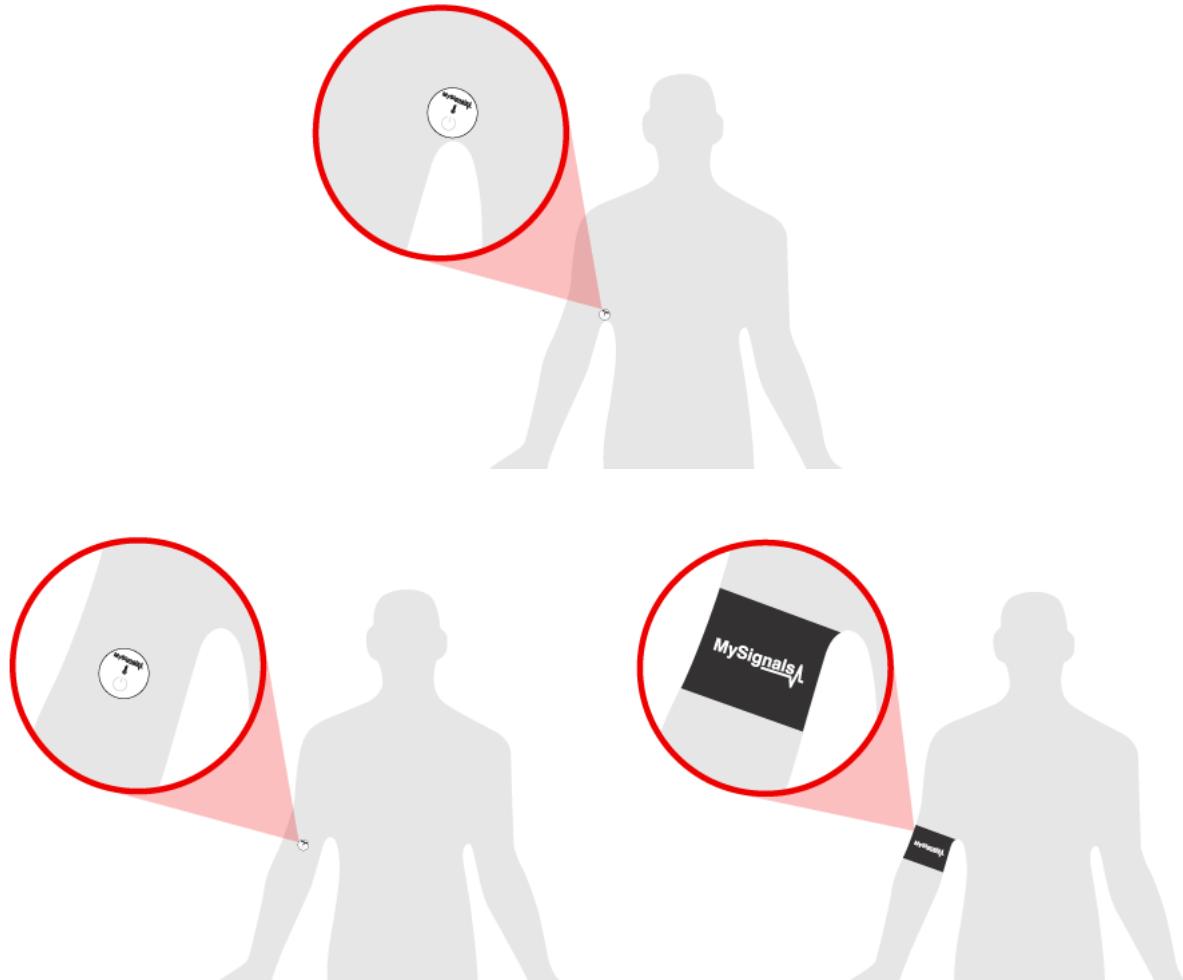


Figure: Body Temperature BLE sensor connection diagram

Do not make abrupt movements or the measure will be not reliable. The sensor will take a few minutes to obtain the correct temperature reading and send them wireless.

After a few seconds you will get the values in the visualization method programmed.

## 7.2.5.3. Examples of use

### Standalone Mode

This is an example of sensor measuring in Standalone Mode.

First of all select the sensor that you want to measure in the Select Sensors screen. Use the touchscreen pressing in the correct symbol. You can see the selected sensors logos in blue color.



Figure: Selected sensor logo

Then you can go to General Sensor screen using the left down corner logo. MySignals will start to monitor all the parameters in General Mode where it only show numeric values.



Figure: General mode and selecting general mode

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

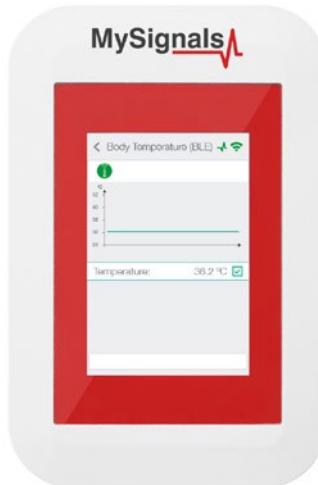


Figure: Detail mode

## MySignals Web Server

This is an example of sensor viewing in MySignals Web Server Mode. First of all choose the sensor that you want to visualize. You can use the fast menu situated in the left side of the Web Server. Choose an user.

The screenshot shows the 'Account Settings' section of the MySignals Web Server. On the left, a sidebar lists 'ORGANIZATION', 'CARDIOLOGY', 'Dermatology', 'TRIUMATOLOGY', 'DEVICES', and 'MEMBERS'. The main area displays account information for 'Demo User (public)'. It includes a profile picture, name, email (redacted), sign-up date (2018-02-07 08:53:06), last update (2018-02-07 08:56:17), and a 'Edit' button. Below this are sections for 'Usage' (License Usage Time, Database Storage 0 of 500000), 'Statistics' (Devices 5/1, Members 15/5, Departments 3/1), and 'Usage by Member' (a table listing 15 members with 0 DB records each). The bottom of the page has a footer with the text '© LifeRun Comunicaciones Distribuidas S.L.'.

Figure: Select user

You can select an upload to the cloud time interval in WiFi setting of 10, 20, 30 or 60 seconds.

Then you can see the General Sensor page. MySignals Web Server will monitor all the parameters in General Mode where it only show numeric values.

You can see in this screen a color code in the sensor logos:

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previously connection of some time ago.
- Grey: It is that the sensor is not connected.

The screenshot shows the MySignals web application interface. On the left, a sidebar lists organizational units: ORGANIZATION (highlighted), CARDIOLOGY, DERMATOLOGY, TRAUMATOLOGY, DEVICES, and MEMBERS. The main content area is titled "Member" and displays a profile picture of a woman named Natalie Schaefer. Below the profile are details: Name: Natalie, Surname: Schaefer, Height: 209 cm, Weight: 119 kg, Member ID: 1, Birthday: 11 Sep 1954, Last update: 2017-09-25 12:58:11-02:00, and Department: Cardiology.

The interface is divided into sections: "Data" and "Monitoring". The "Data" section contains a list of physiological parameters with their normal ranges:

- Body position
- Temperature (Normal measure: 36 - 38 °C)
- Muscle contraction (cpm) (Normal measure: 0 - 10 cpm)
- Heart rate (bpm) (Normal measure: 60 - 120 bpm)
- Respiratory rate (bpm) (Normal measure: 12 - 25 bpm)
- Conductance (Normal measure: 3 - 7 µS)
- Diastolic pressure - Systolic pressure (Normal measure: 40 - 80 mmHg - 80 - 120 mmHg)
- Oxygen saturation (Normal measure: 95 - 98 %)
- Glucose mg (Normal measure: 72 - 114 mg/dl)
- PEF - FEV1 (Normal measure: 540 - 780 l/min - 180 - 900 l)
- Snore rate (spm) (Normal measure: 12 - 25 spm)
- Weight (Normal measure: 40 - 120 Kg)
- Diastolic pressure - Systolic pressure (Normal measure: 40 - 80 mmHg - 80 - 120 mmHg)
- Oxygen saturation (Normal measure: 95 - 98 %)
- Glucose (Normal measure: 72 - 144 mg/dl)
- EEG Attention - EEG Meditation (Normal measure: 10 - 50 % - 10 - 50 %)
- Temperature : 37.25 °C (Normal measure: 26 - 38 °C)
- Alarm Button : OFF

Figure: General mode Web Server

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

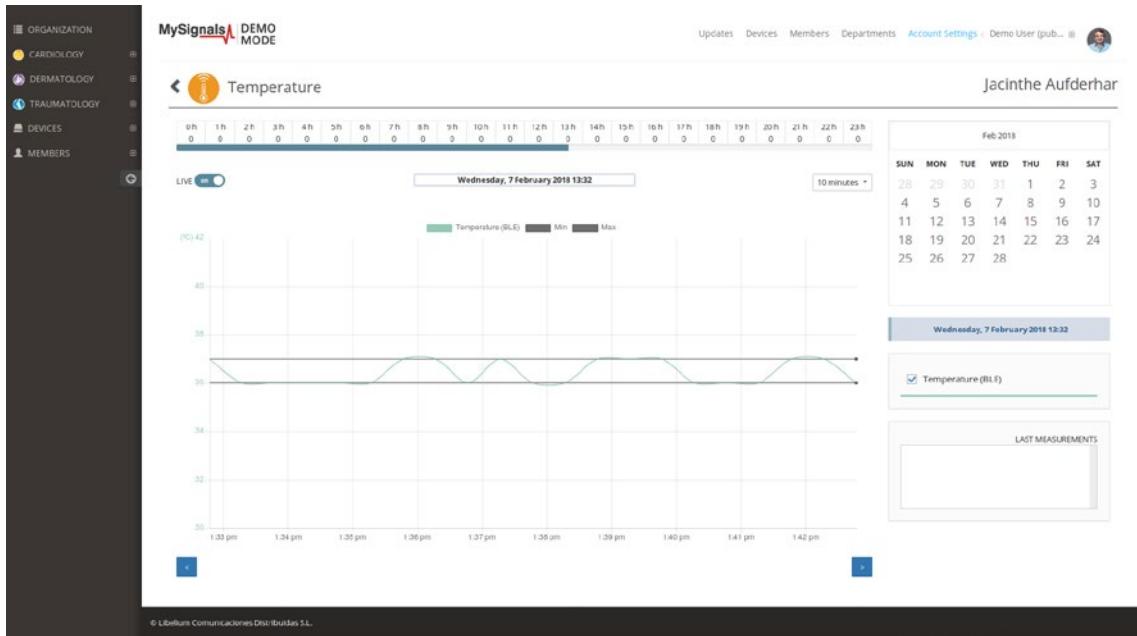


Figure: Detail mode Web Server

You can change the interval that configures MySignals to send data to the server. Introduce the value in seconds. MySignals will send data to the server as it is configured.

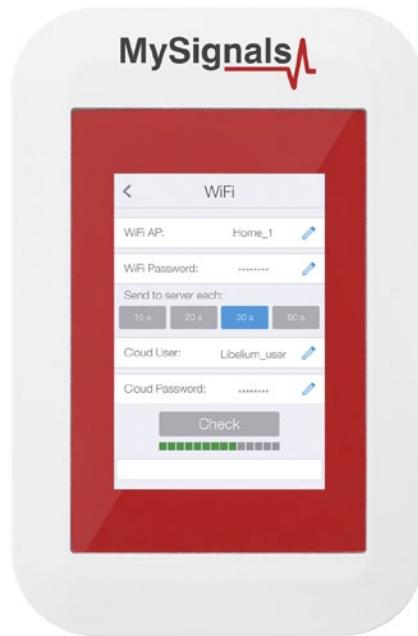


Figure: WiFi settings

## 7.2.6. Alarm button (BLE)

Emergencies can happen at any time and anywhere in your house. The alert button provides immediate access to assistance with just the touch of the button.

### 7.2.6.1. Sensor features

**Description:** This call button can be worn as a help pendant around your neck or as an alert watch button around your wrist.

The best part about the medical alert button is its simplicity. In an emergency, it is large and easy to press. Unlike other systems or a cell phone, you don't have to think about what numbers to dial, which buttons to press, or if it's charged up. Your medical alert button is always ready.



Figure: Alarm Button BLE sensor

This sensor uses 1 CR2032 button cell.

[Buy the Alarm Button BLE Sensor PRO for MySignals \(eHealth Medical Development Platform\)](#)

### 7.2.6.2. Connecting the sensor

This sensor have not cable. This sensor send the data wireless to MySignals board.

Power on the module using the button. Keep during 2 seconds the central button.



Figure: Alarm Button BLE sensor ON button

Wait until MySignals program indicate that it is connected with the BLE sensor.



Figure: Alarm Button BLE sensor connection

After connection, use the central button when you need help or assistance. You can use the button again in order to stop the alarm. After a few seconds you will get the values in the visualization method programmed.

## 7.2.6.3. Examples of use

### Standalone Mode

This is an example of sensor measuring in Standalone Mode.

First of all select the sensor that you want to measure in the Select Sensors screen. Use the touchscreen pressing in the correct symbol. You can see the selected sensors logos in blue color.

**NOTE:** The alarm sensor can not operate at the same time that the other BLE sensors, for this reason it is not possible to select this sensor at the same time with other Bluetooth sensors in MySignals.



Figure: Selected sensor logo

Then you can go to General Sensor screen using the left down corner logo. MySignals will start to monitor all the parameters in General Mode where it only show numeric values.

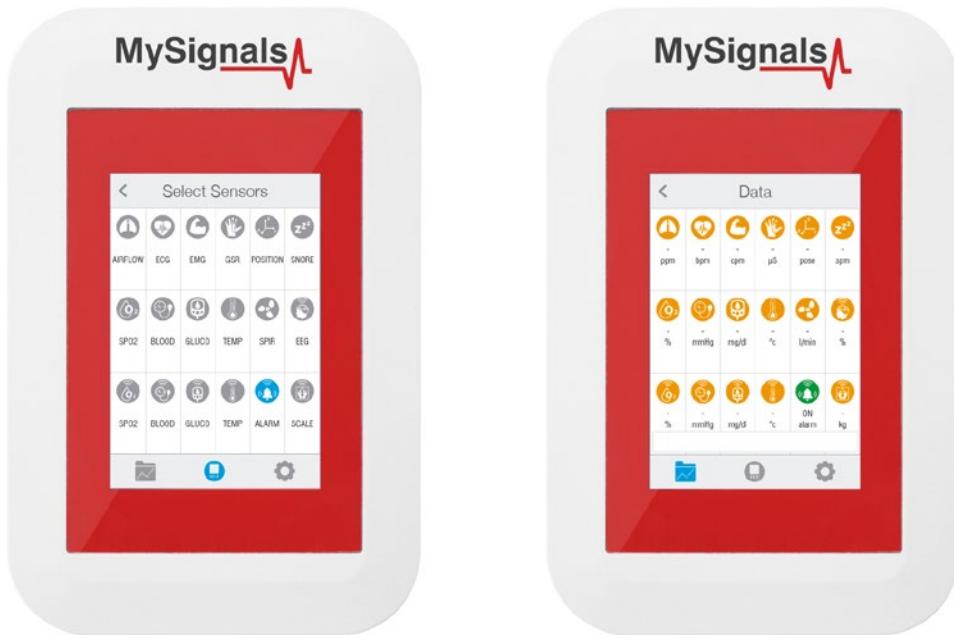


Figure: General mode and selecting general mode

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

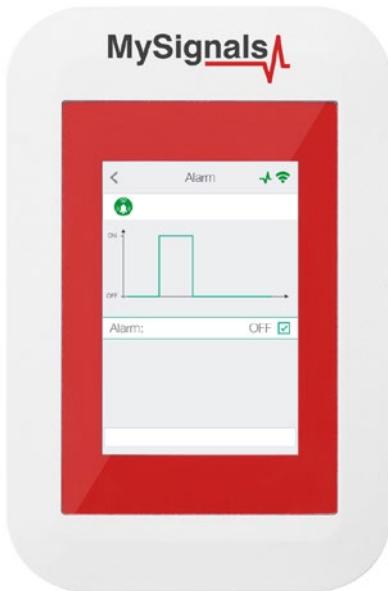


Figure: Detail mode

## MySignals Web Server

This is an example of sensor viewing in MySignals Web Server Mode. First of all choose the sensor that you want to visualize. You can use the fast menu situated in the left side of the Web Server. Choose an user.

The screenshot shows the 'Account Settings' page of the MySignals Web Server. On the left, a sidebar lists 'ORGANIZATION', 'CARDIOLOGY', 'Dermatology', 'TRIUMATOLOGY', 'DEVICES', and 'MEMBERS'. The main content area has tabs for 'Usage' and 'Statistics'. Under 'Usage', there are sections for 'License Usage Time' (with a progress bar at 100%), 'Database Storage' (0 of 500000), and 'API Calls' (warning: 'Your license has no API Cloud access' and 'License expire on: 2019/01/07'). Under 'Statistics', it shows 'Devices' (5/1), 'Members' (15/5), and 'Departments' (3/1). Below these are sections for 'Usage by Member' and 'DB records (%)'. The 'Usage by Member' section lists 15 members with their names and profile icons, each with a progress bar at 0% and an 'Action' button. The 'DB records (%)' section shows the same 15 members with their names and profile icons, each with a progress bar at 0% and an 'Action' button.

Figure: Select user

You can select an upload to the cloud time interval in WiFi setting of 10, 20, 30 or 60 seconds.

- Green: It is a real-time value measured in MySignals Software
- Orange: It is a old value measured in a previously connection of some time ago.
- Grey: It is that the sensor is not connected.

The screenshot shows the MySignals web interface. On the left, a sidebar lists organization categories: ORGANIZATION (with CARDIOLOGY highlighted), DERMATOLOGY, TRAUMATOLOGY, DEVICES, and MEMBERS. The MEMBERS section shows a list of users: Armine Fisher, Geraldine SLL..., Germaine QUIT..., Rylee Terry, and Sondy Buckrid... Below this is a 'Data' section listing various sensors:

Sensor Type	Description	Normal Range
Body position		
Temperature	Normal measure: 36 - 38 °C	
Muscle contraction (cpm)	Normal measure: 0 - 10 cpm	
Heart rate (bpm)	Normal measure: 60 - 120 bpm	
Respiratory rate (ppm)	Normal measure: 12 - 25 ppm	
Conductance	Normal measure: 2 - 7 µS	
Dia stolic pressure / Systolic pressure	Normal measure: 40 - 80 mmHg / 80 - 120 mmHg	
Oxygen saturation	Normal measure: 95 - 98 %	
Glucose mg	Normal measure: 72 - 114 mg/dl	
PEF / FEV1	Normal measure: 540 - 780 l/min / 180 - 300 l	
Snore rate (spm)	Normal measure: 12 - 25 spm	
Weight	Normal measure: 40 - 120 kg	
Dia stolic pressure / Systolic pressure	Normal measure: 40 - 80 mmHg / 80 - 120 mmHg	
Oxygen saturation	Normal measure: 95 - 98 %	
Glucose	Normal measure: 72 - 144 mg/dl	
EEG Attention / EEG Meditation	Normal measure: 30 - 50 % / 30 - 50 %	
Temperature : 37.25 °C	Normal measure: 35 - 38 °C	
Alarm Button : OFF		

Figure: General mode Web Server

Finally, you can go to detail mode for each sensor selected. Press in the logo of the sensor in General Mode if you want to see the graphical and numeric values of a specific sensor.

The screenshot shows the MySignals web interface in detail mode for the sensor 'Alarm Button' for user 'Carroll Mueller'. The table lists 20 entries of the alarm button being triggered over time:

Value	Time stamp
ON	2017-05-05 10:42:00
ON	2017-05-05 10:42:04
ON	2017-05-05 10:42:05
ON	2017-05-05 10:42:06
ON	2017-05-05 10:42:07
ON	2017-05-05 10:42:10
ON	2017-05-05 10:42:11
ON	2017-05-05 10:42:13
ON	2017-05-05 10:42:14
ON	2017-05-05 10:42:18
ON	

Figure: Detail mode Web Server

You can change the interval that configure MySignals to send data to the server. Introduce the value in seconds. MySignals will send data to the server as it is configured.

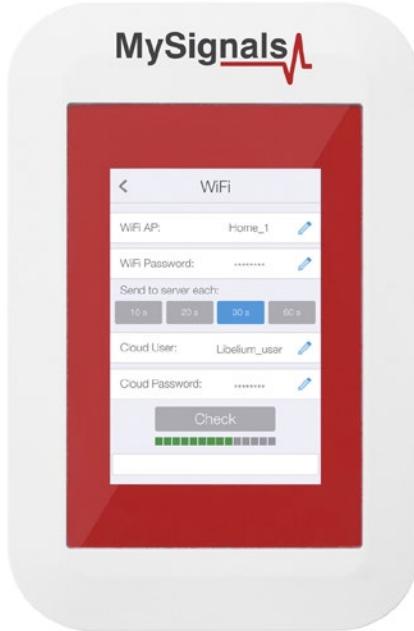
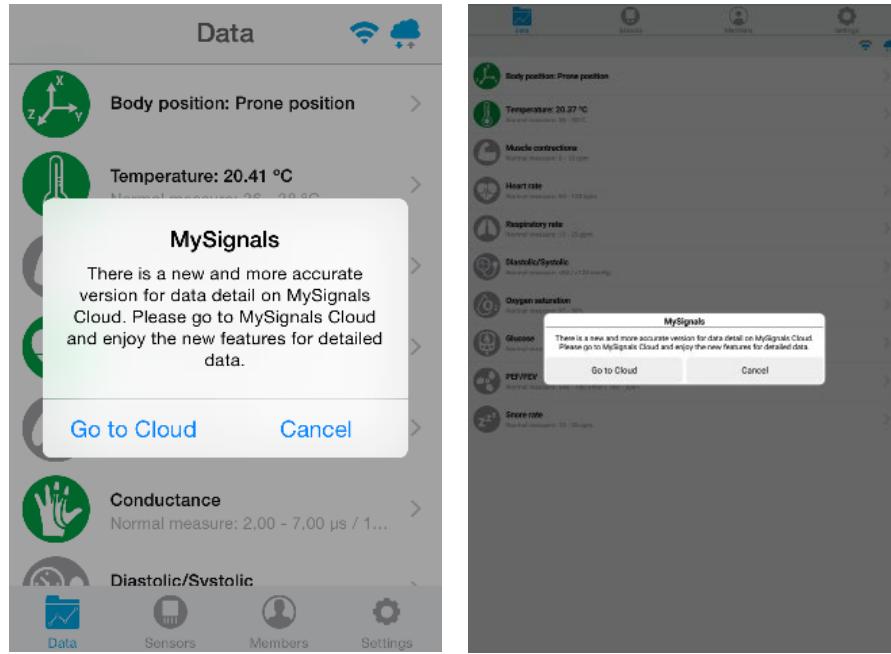


Figure: WiFi settings

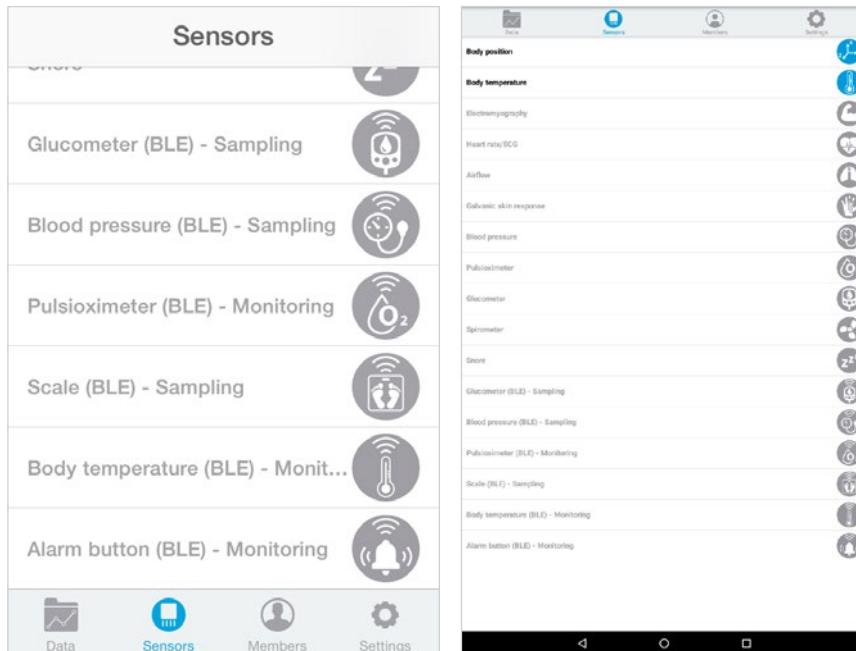
## 7.3. Bluetooth sensors on mobile Applications

**NOTE:** All detail screen for sensors on Mobile applications were replaced for a completely new web detail on MySignals Cloud, if you click onto a sensor in iPhone or Android application you will get a popup message pointing the new MySignals Cloud, there you can enjoy the new features for each sensor detail.



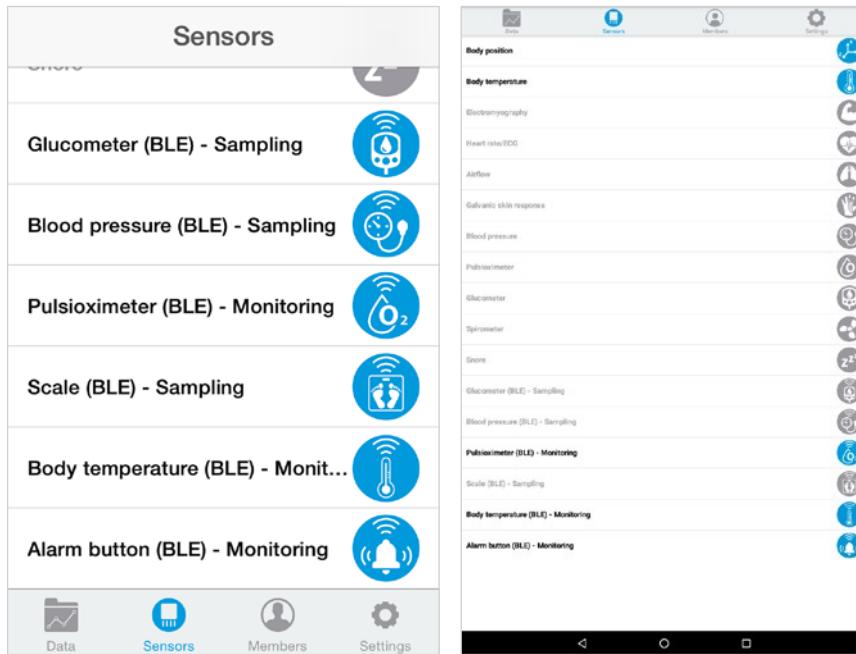
On this new release, the mobile Application are able to communicate directly with Bluetooth sensors, this is possible due to in-Application implementation on both mobile Applications. The set of sensors are: pulsioximeter, blood pressure, glucometer, temperature, alarm and scale. All Bluetooth sensors can operate with MySignals device at the same time.

Using this guide you can get information about how to connect and perform measures with each one.

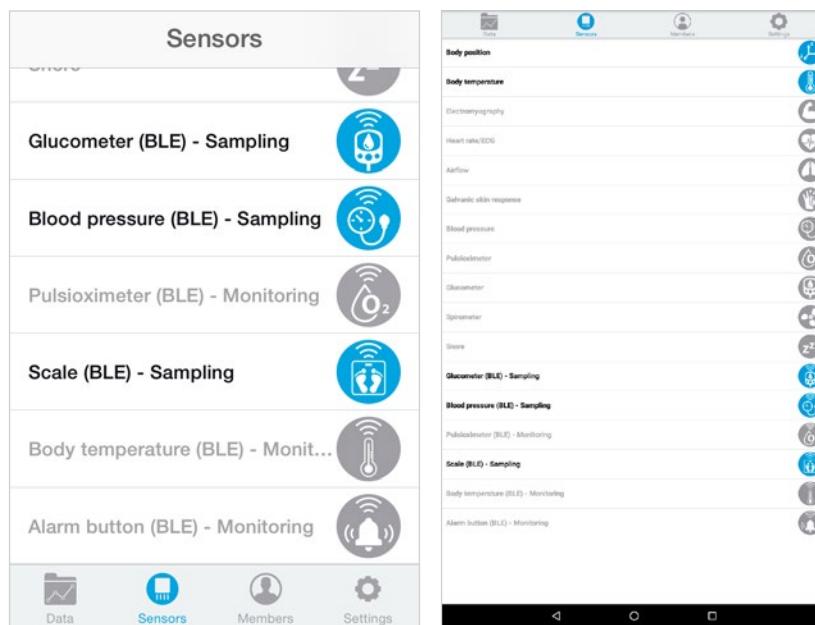


Inside these Application we make difference between two types of Bluetooth sensors:

- **Monitoring sensors:** They give a continuous data on main data screen and inside the detail screen of each one.



- **Sampling sensors:** They give a single measure each time and the user must connect with the Application on detail screen from each sensor.



### 7.3.1. Monitoring sensors

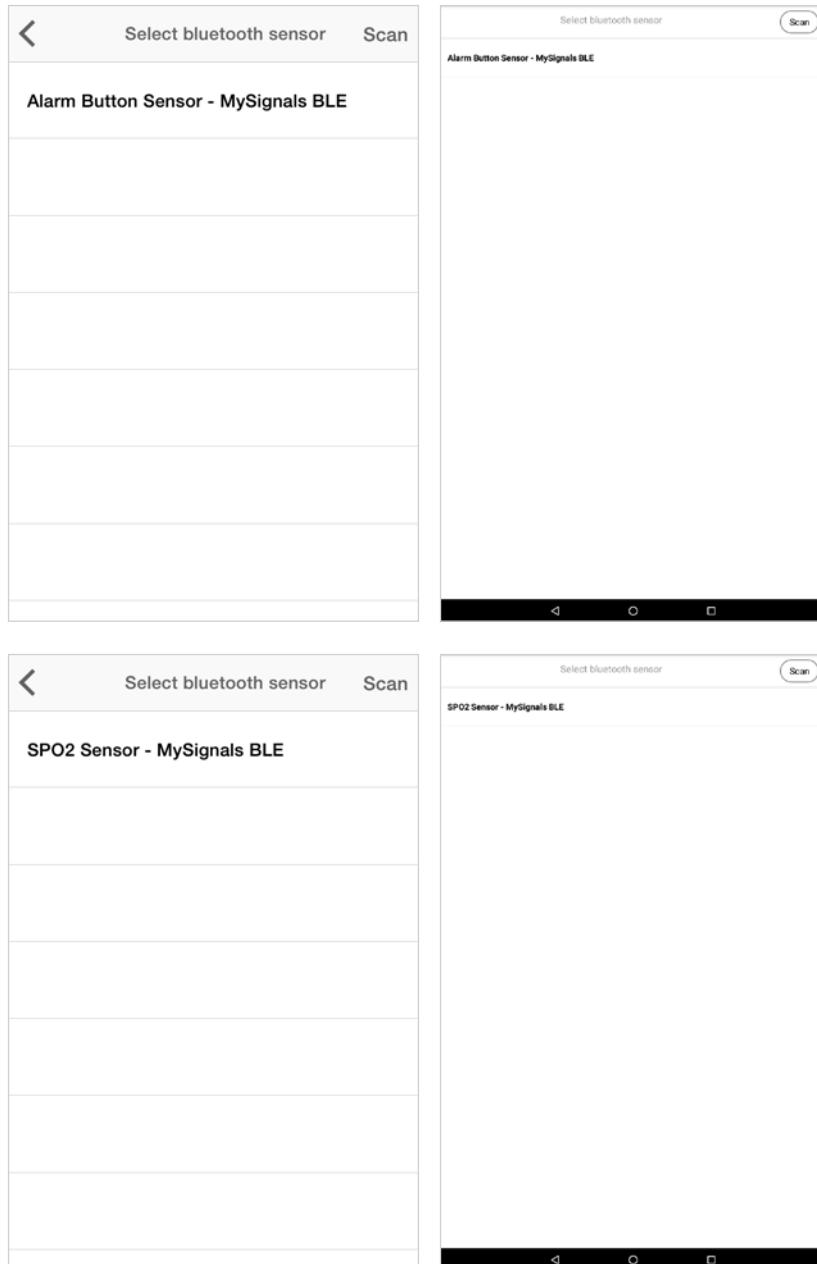
These set of sensors are Bluetooth pulsioximeter, Bluetooth temperature and Bluetooth alarm. These three item have the same steps to connect them.

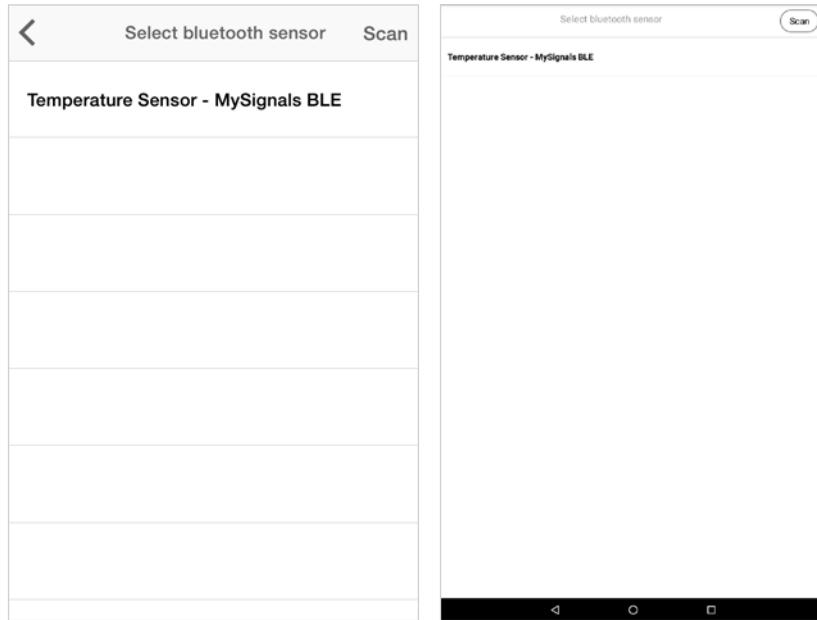
Now we are going to describe how to connect each one and how to obtain data from each sensor with a set of simple steps.

#### 7.3.1.1. Connect to sensor

Go to sensors list screen and tap on one of these three sensors to select one, The first time the Application will point to a new screen to select the sensor, make sure that the sensor if off before this new screen shows. Once you turn on the Bluetooth sensor the mobile Application will discover sensor nearby, this screen will only show sensors provided with MySignals.

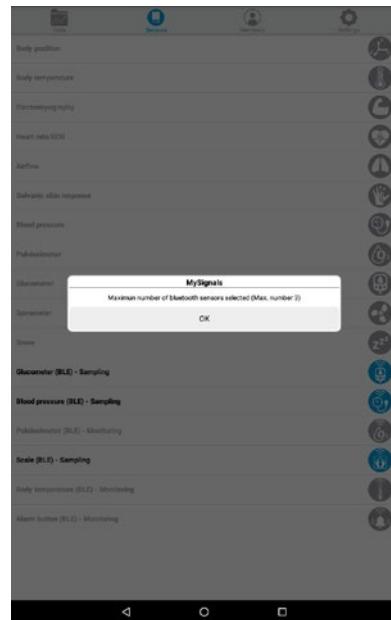
For instance these are the examples you will find when discovering new monitoring sensors:





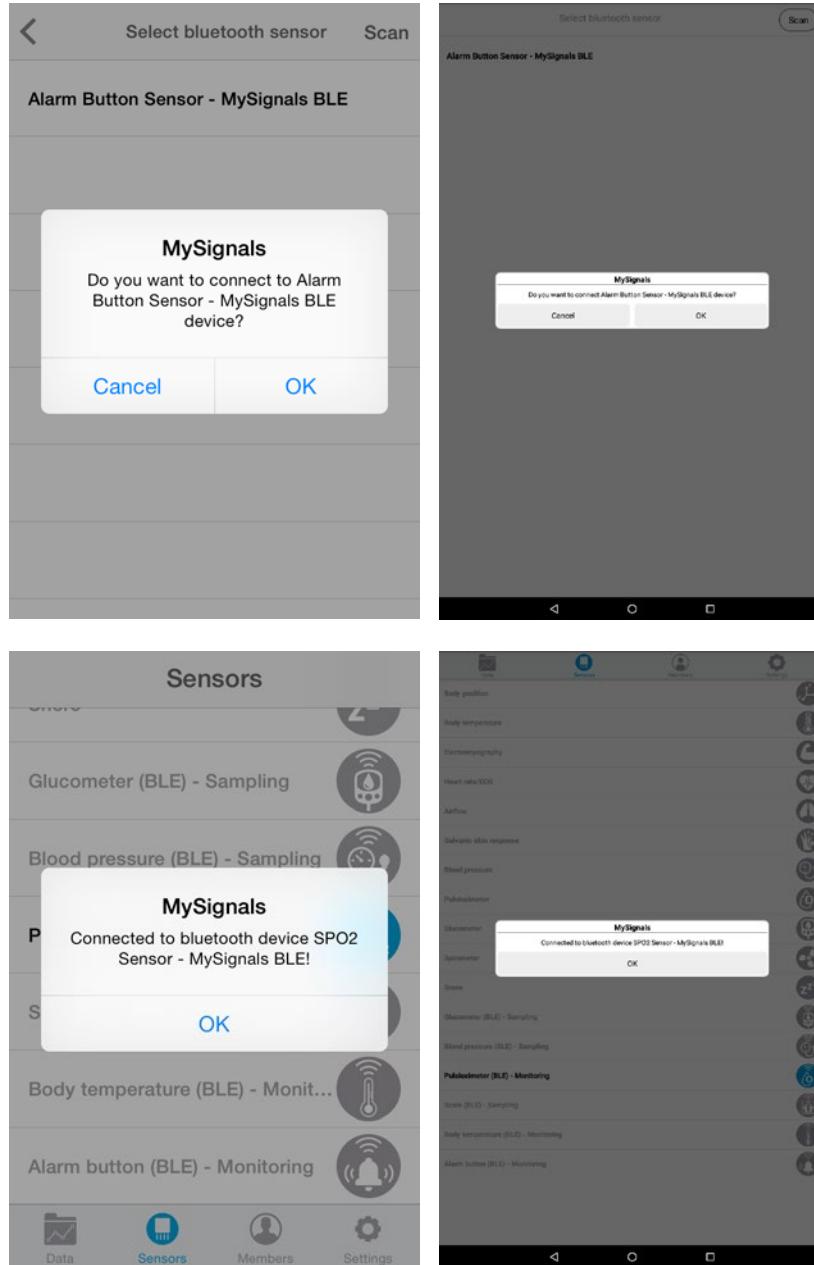
If the mobile Application has established a previous connection, when the user taps on one monitoring sensors the Application will try to connect the last used bluetooht sensor, but if this connection fail the Application will show the new scan screen to discover the device again.

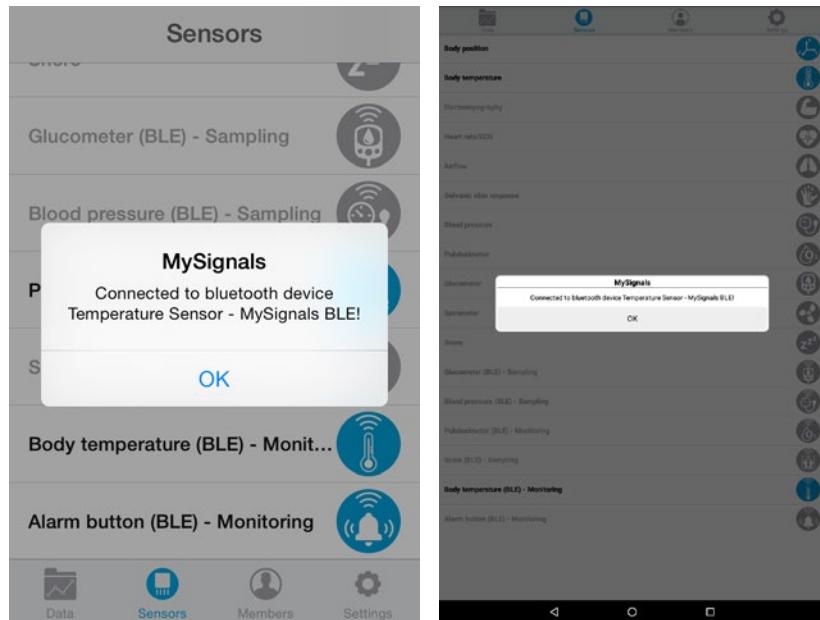
There is no limit about number of connected Bluetooth devices on iPhone but on Android these is a limitation of three Bluetooth peripherals connected (plus MySignals device), this was made to provide the Application a stable connection along all the lifecycle until the user quits the mobile Application.



### 7.3.1.2. Connection confirmation

Once the user select a discovered sensor on Bluetooth discovery screen, the Application will show a confirmation message:



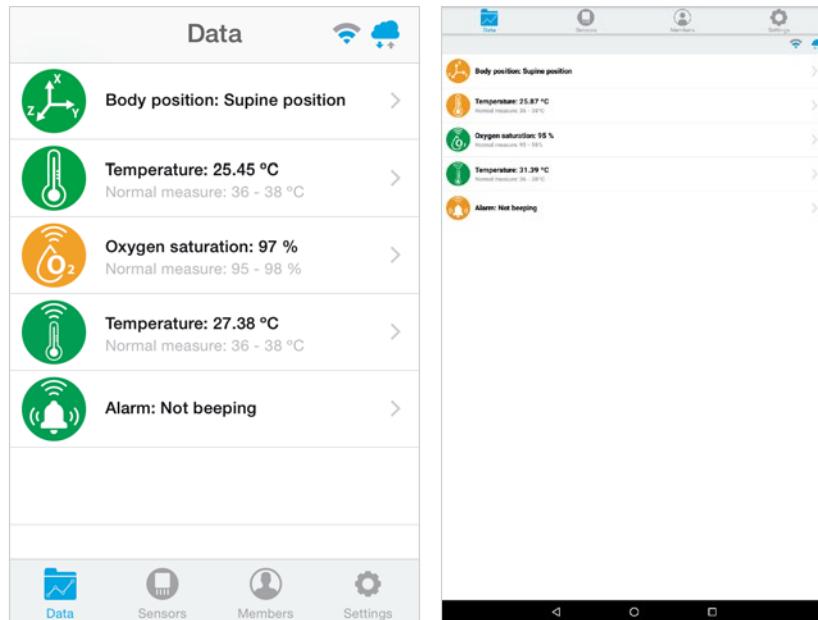


Each time the user want to disconnect from a monitoring type sensor, just touch again on the blue lighted sensor and it will turn grey and disappear. When the scale connects with MySignals appears from main data screen.

These kind of sensors perform a reconnection periodically, then if the user has these sensors selected but the Bluetooth device is turned off just wait until the Application reconnects with the Bluetooth sensor. The reconnection time can last until one minute.

### 7.3.1.3. Main data screen

Now the Application has one or more monitoring sensors enabled. You can see how the Application is receiving data for each sensor with the same way provided for MySignals device.



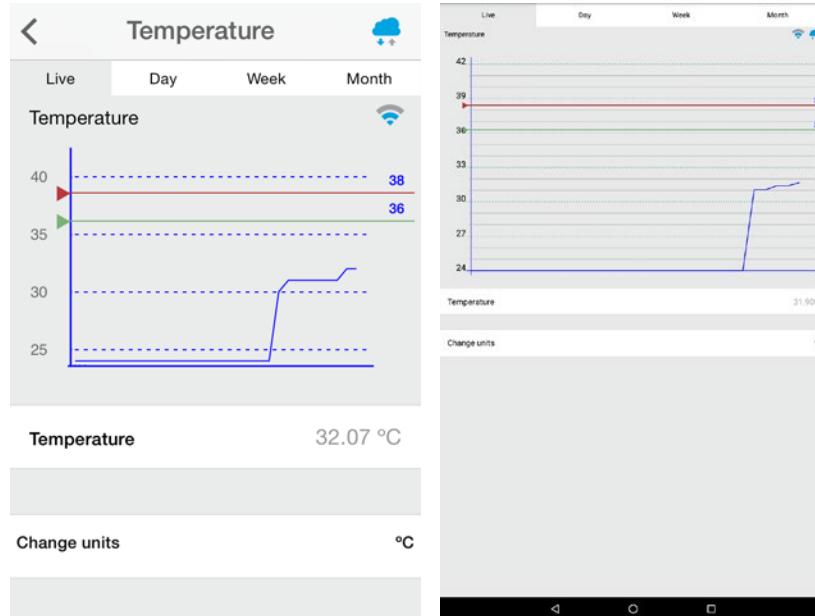
When the mobile Applications receives a new data entry from a Bluetooth sensor the icon will turn green, but if the mobile Application does not have new data from the Bluetooth sensor the icon will turn orange and the Application will show the last value obtained. If the icon from the sensor is grey it means that the mobile Application never obtained new data from the Bluetooth sensor.

### 7.3.1.4. Detail screen

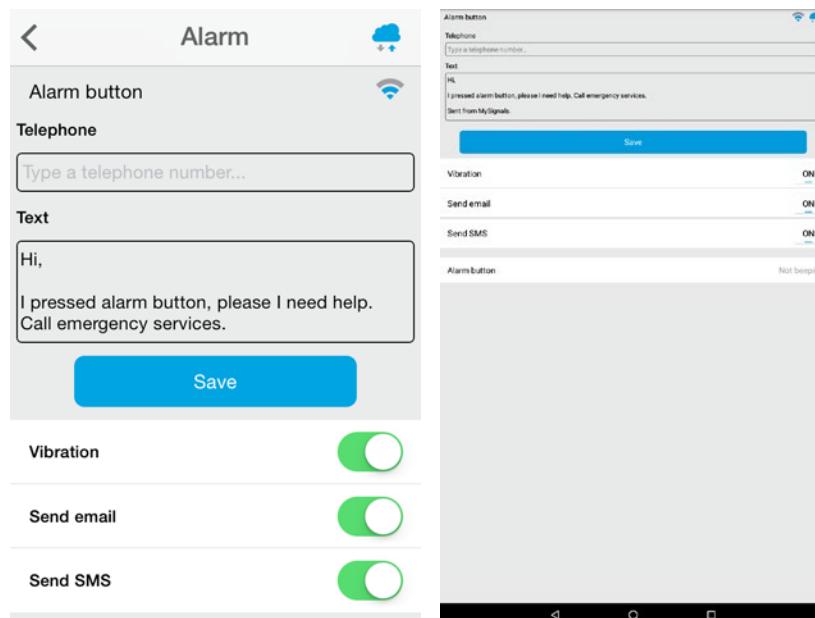
Each monitoring sensor has a different screen because the data provided for each one is slightly different, each detail screen has a different way to present the data and each one perform different operations.

The mobile Application provides the classical functionality provided for MySignals for all monitoring Bluetooth sensors, the user can track live data and a graph and also can view historical data for las day, last week and last month.

Detail screen are the same as MySignals device for Bluetooth temperature and Bluetooth pulsioximeter sensors:

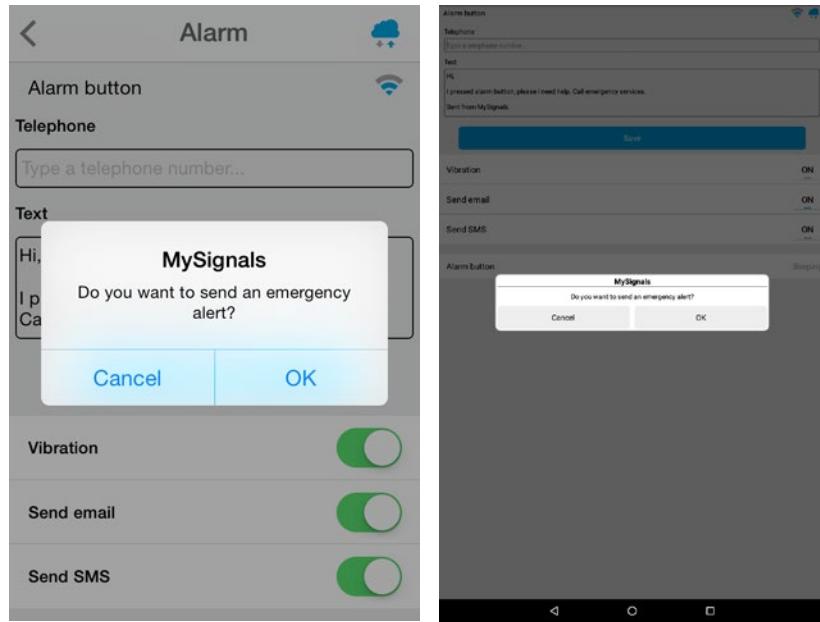


On these version we introduce a new sensor, the panic alarm button, these button starts a sound and a buzz to warn people about a problem and also sends an alert message.



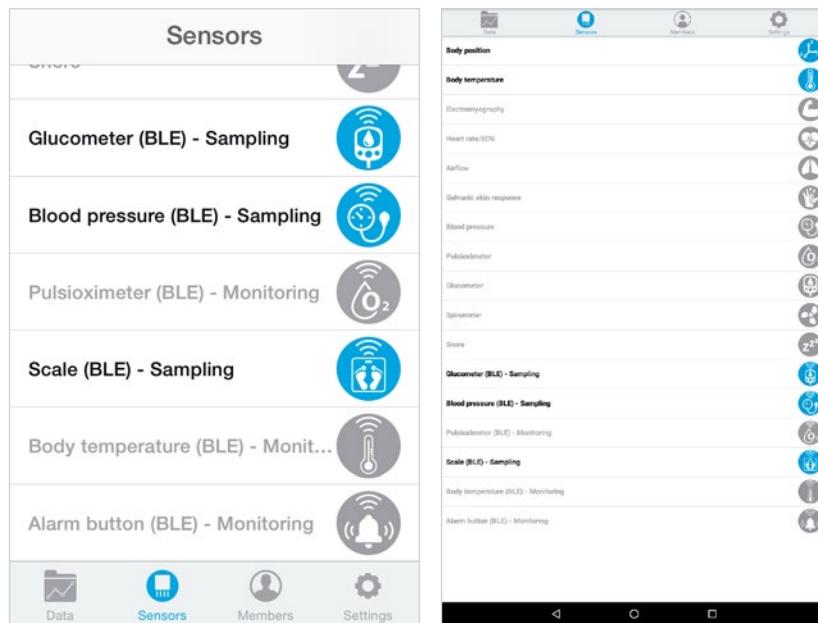
As the detail screen shows, the user can send an email or sms to notify the user about a problem, also it is possible to set a custom message and a phone number as destination.

Each time somebody pushes the alarm button a message will pop up on the mobile Application, no matter the current active screen of the mobile Application, the message will show on top and it can send the message through this alert message.

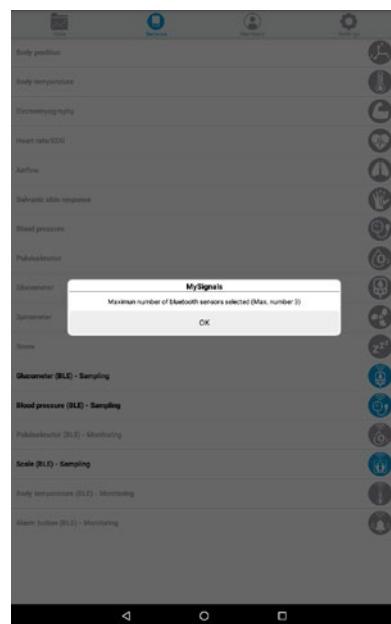


### 7.3.2. Sampling sensors

This set of bluetooth sensors is provided by Bluetooth blood pressure, Bluetooth glucometer and Bluetooth scale.



As said with monitoring sensors, there is no limit about number of connected Bluetooth devices on iPhone but on Android these is a limitation of three Bluetooth peripherals connected (plus MySignals device), this was made to provide the Application a stable connection along all the lifecycle until the user quits the mobile Application.

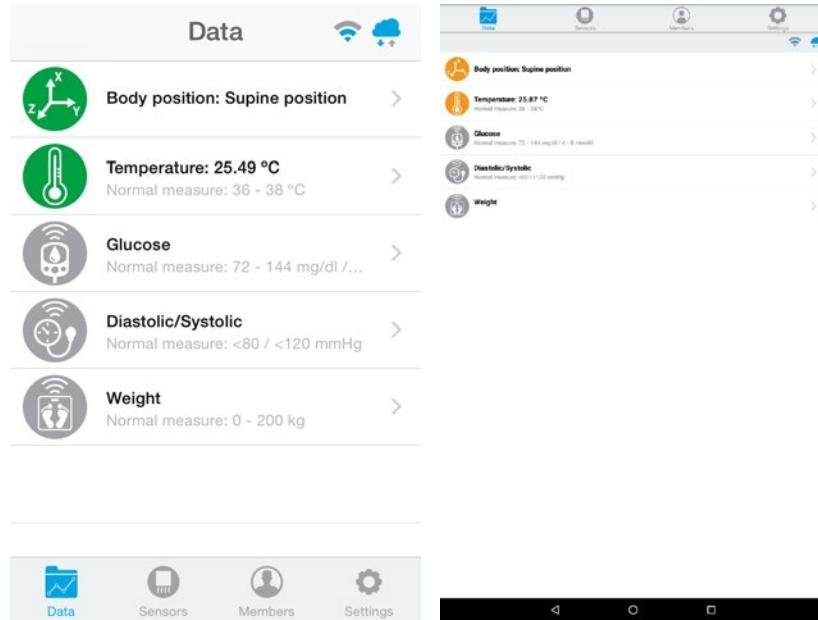


These sensors must be connected on detail screen, then the user must perform the connection only in one sensor at the same time in the detail screen.

### 7.3.3. Selecting sensors

It is very easy to select these kind of sensors, just tap over each one and they will be selected and show up on main data screen. To deselect these sensors just tap again and the light icon will turn grey and will disappear from main data screen.

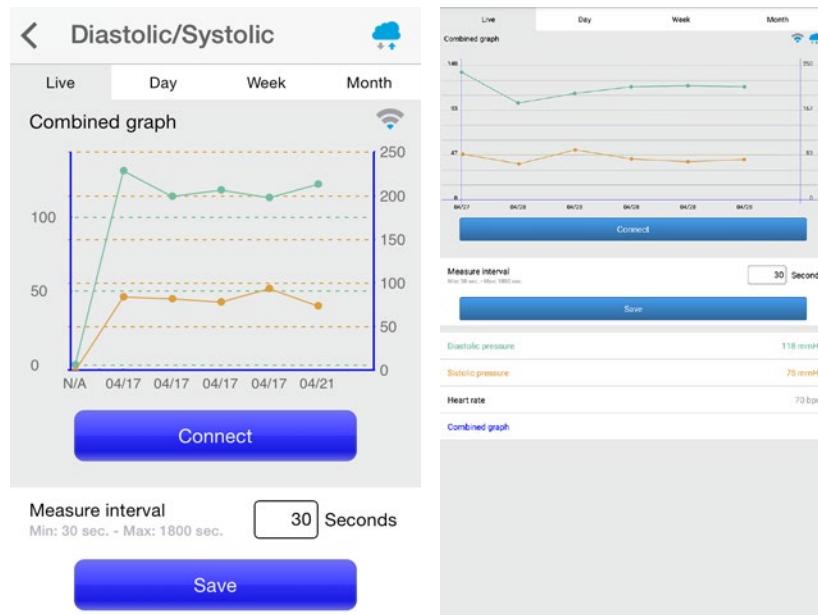
Once you select one or more sampling sensor, they will be shown on main data screen.

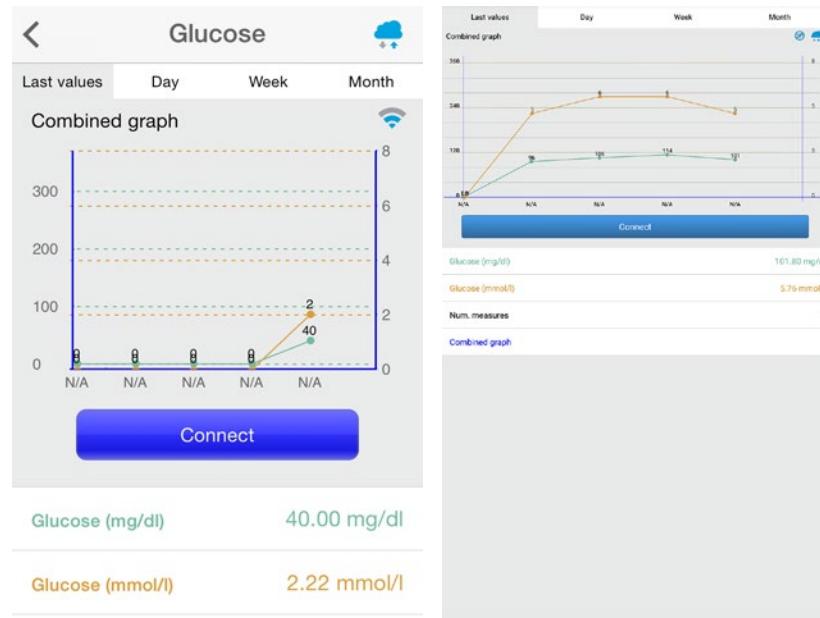


#### 7.3.3.1. Detail screen

On these detail screens, all sampling sensors shares common elements on the interface, but there is also differences between them.

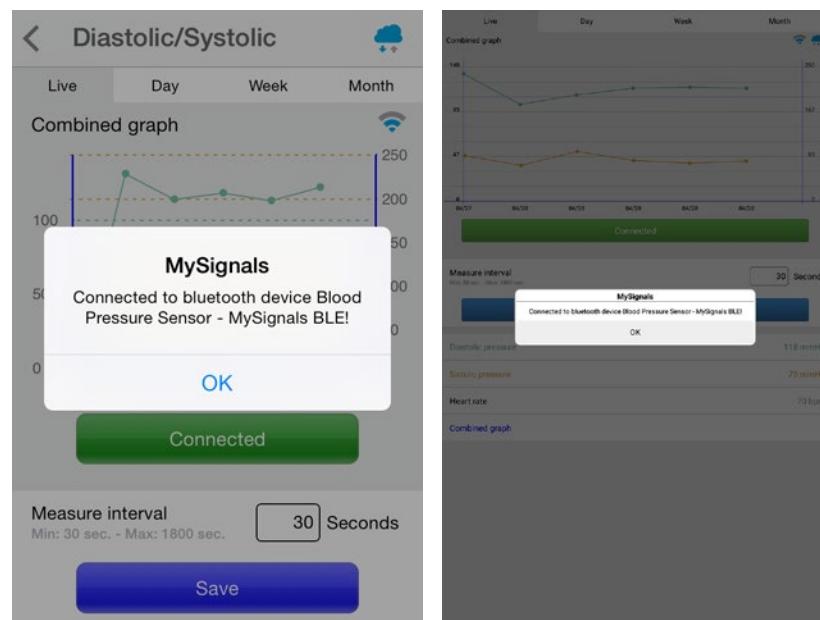
There is a common connect button on the details screen, the function of this element is easy, it creates a new connection between the Bluetooth sensor and the mobile Application like the monitoring sensors.

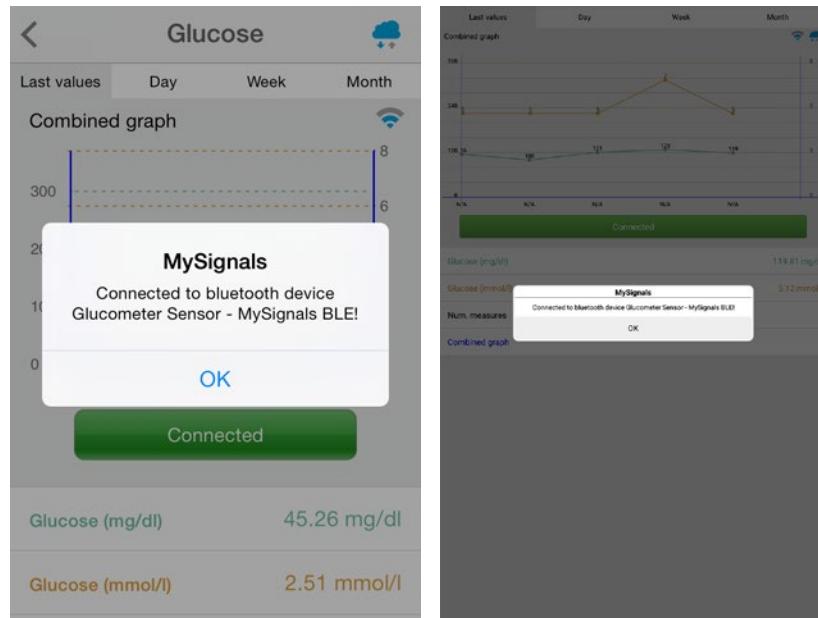




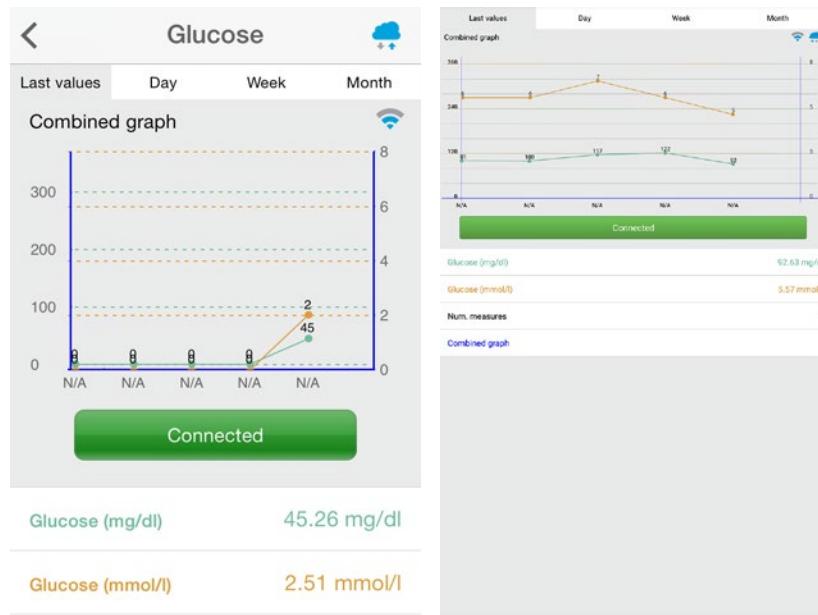
The first time the button connect is pushed, the mobile Application will show a new screen to select the Bluetooth sensor, this screen will show only Bluetooth sensors provided with MySignals. The following tries the Application will establish a connection with the Bluetooth sensor and in case the mobile Application cannot establish it will show a new screen to discover Bluetooth sensors.

Once a Bluetooth sensor is selected, the mobile Application warns about the successful connection and the blue button labeled as "Connect" will turn to green colour and it will labeled as "Connected".

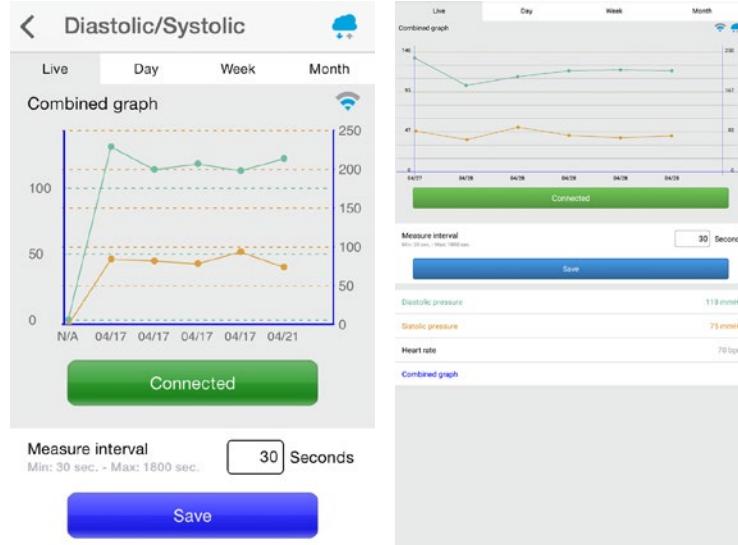




After that the sensor starts measuring:



We introduce another new feature available on bluetooth blood pressure sensor. This screen allows the user to set the measure interval on blood pressure, this values start from 30 seconds to 1800 seconds. Blood pressure sensor will start measuring again after this value and it will loop until the user exits from detail screen or turns off the Bluetooth device.



Each time a new value is written, the user should press save button below the text box to save the changes.

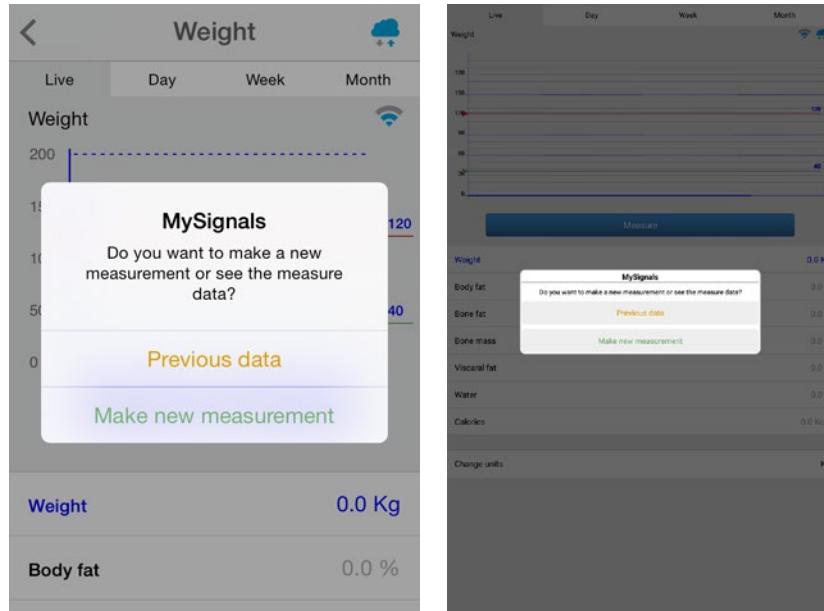
When the user go back to main data screen the connection between the Application and the Bluetooth sensor stops, then each time the user enters the detail screen for a sampling sensor it is mandatory to establish a new Bluetooth connection as described before.

For a better use of these sensors we recommend to turn off and on the Bluetooth sensor before connecting with the mobile Application.

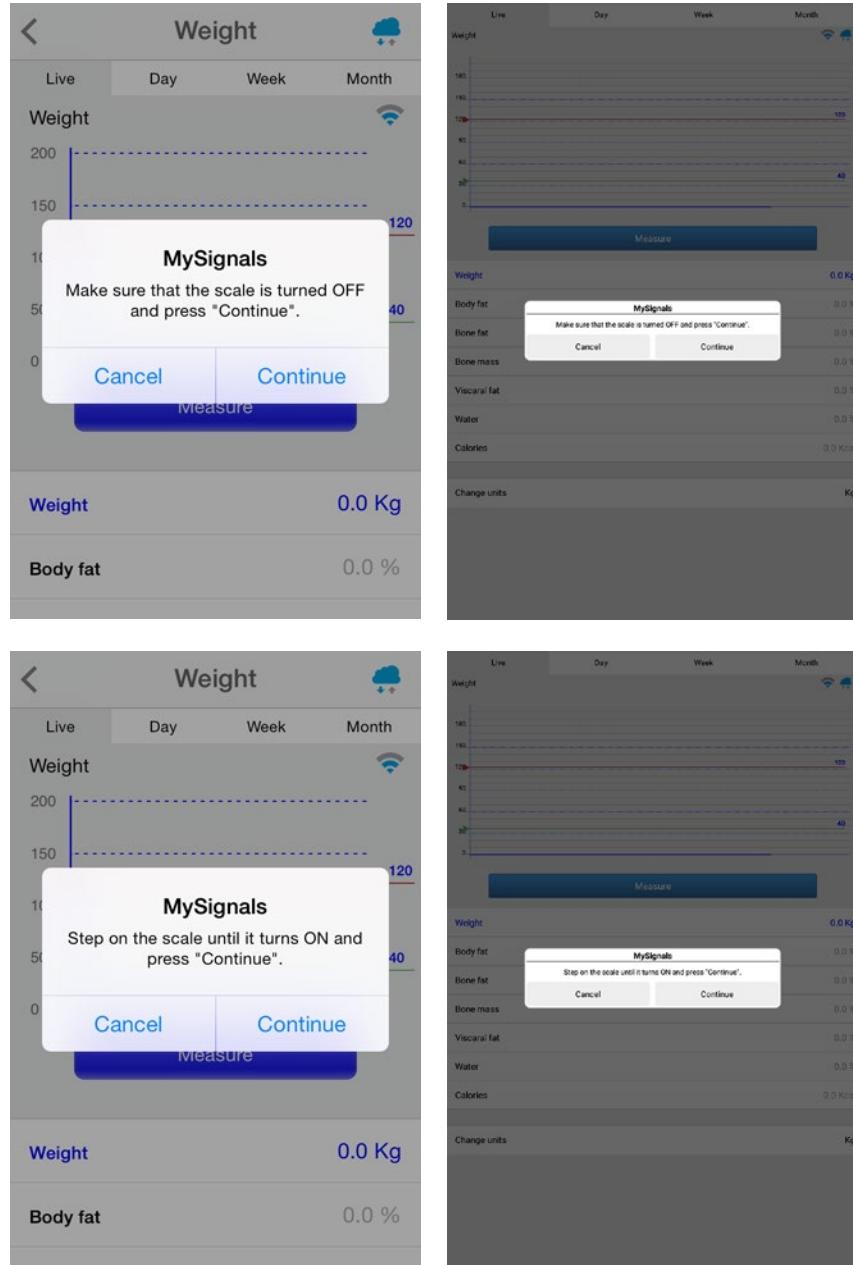
**Warning:** We experienced that some Bluetooth chipsets cannot connect to Bluetooth scale. Specifically, we found this behaviour on BQ devices.

There is one special detail screen, the scale. Let's explain the workflow:

First of all, a main alert will show up, you can choose between display data already measured and perform a new measure:

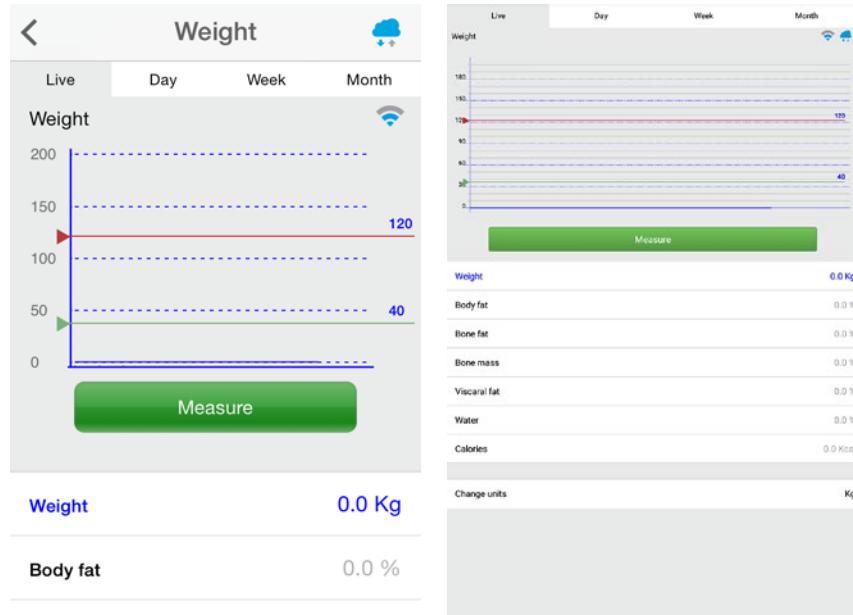


If you choose "Make new measurement" you will start a little wizard that shows how to perform a measure, this wizard required a 2-step setup: first one, "make sure that the scale is turned off" and second "step on the scale".

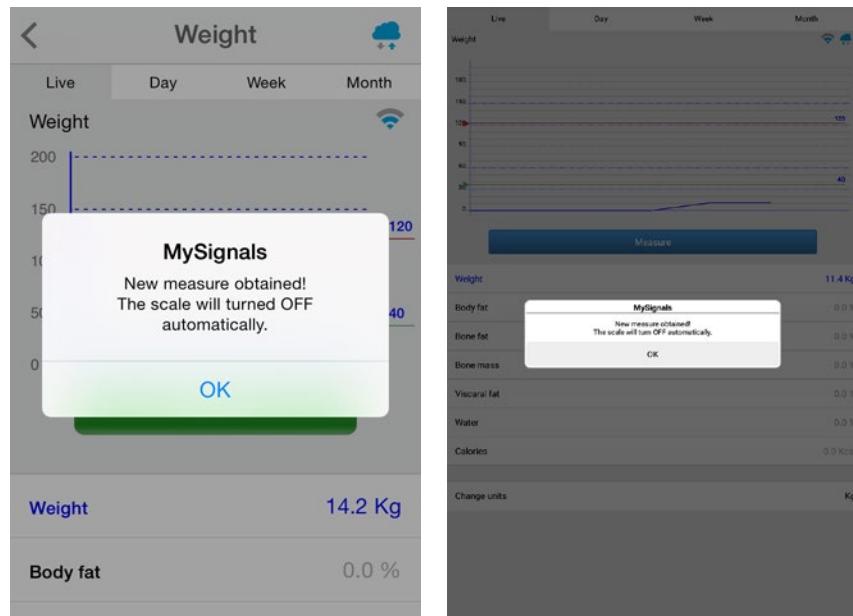


Sometimes, when the scale is turned off and the user steps on again, the sensor scale can display a not accurate weight, in this case you should step off the scale until it shows zero weight, then you can step on again to perform the measure.

When the scale connects with MySignals applications, the blue button labeled as "Measure" turn green.



After that wait a moment until the new measure is received from the scale sensor into the Application, as a result the Application will let you know when the process has finished.



## 8. Updating Firmware

Libelium Smart Devices App allows users install new firmware versions and program the configuration of new Libelium products in a few clicks. Download the Java Application at:

LINUX:

[http://downloads.libelium.com/smart\\_device\\_app/SmartDeviceApp\\_linux64.zip](http://downloads.libelium.com/smart_device_app/SmartDeviceApp_linux64.zip)

MAC:

[http://downloads.libelium.com/smart\\_device\\_app/SmartDeviceApp\\_macosx64.zip](http://downloads.libelium.com/smart_device_app/SmartDeviceApp_macosx64.zip)

WINDOWS:

[http://downloads.libelium.com/smart\\_device\\_app/SmartDeviceApp\\_windows32.zip](http://downloads.libelium.com/smart_device_app/SmartDeviceApp_windows32.zip)

### INSTALLATION

First of all and before installing anything, users have to take into account the platform where the Application is going to be installed. To install the Libelium Smart Devices App, it is compulsory to have installed the JDK 1.7 at least. If it is not installed in the computer, you can follow the steps and download it from this website:

[https://docs.oracle.com/javase/8/docs/technotes/guides/install/install\\_overview.html](https://docs.oracle.com/javase/8/docs/technotes/guides/install/install_overview.html)

Once installed JDK, users have to download Libelium Smart Devices App. Copying and pasting this URL in a web browser, the file will be downloaded. Once downloaded it, users only have to extract the content of the zip file in a place with the right permissions, and finally execute the file called "SmarDeviceApp" that will initialize the Application. Please, note that the extension of this file will depend on the operative system the user is using at the moment (sh for Linux and OSX, and bat for Windows).

**IMPORTANT: DO NOT UNPLUG MySignals WHILE IT IS BEING UPGRADED OR IT MAY BE RENDERED USELESS! (THIS CASE IS NOT COVERED BY THE WARRANTY).**

## 8.1. Libelium Smart Devices App

This section explains every option that the Application offer to users with the purpose of updating the device.

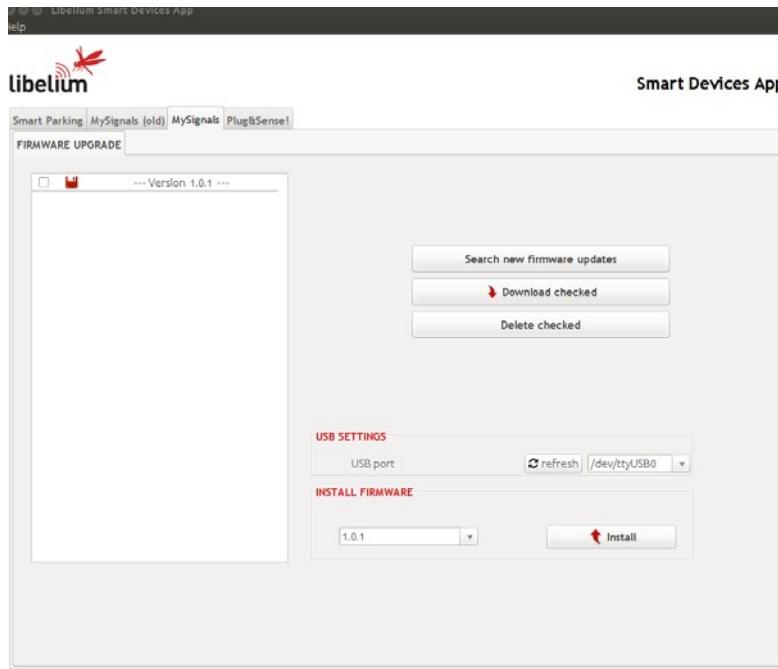


Figure: Libelium Smart Devices App

### Step 1: Open the USB connector

Remove the protection cap of the USB connector.



Figure: USB protection cap

### Step 2: Connect the USB cable to MySignals

Connect one side of the male-to-male USB cable to the USB connector.



Figure: USB programming cable

### Step 3: Connect the USB cable to the PC

Users have to connect the device to the computer where the Smart Devices App is installed using the USB cable provided.

Now open Libelium Smart Devices App . If you do not have Libelium Smart Devices App already installed in your PC, then go to the Development section of Libelium website to download it.

### Step 4: USB setting

Select the corresponding serial port by going to tools/serial port. If you are unable to see the proper USB port maybe you should install the latest FTDI drivers on your PC. Then, refresh the “USB settings” block which is in the middle part of the tab, clicking in “refresh” button. Once done it, the port where the device has been connected must be selected.

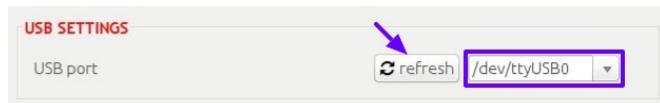


Figure: USB setting

### Step 5: Download firmware versions

First of all click on the “Search new firmware updates” button. Then mark the desired version and click on “Download checked” button.

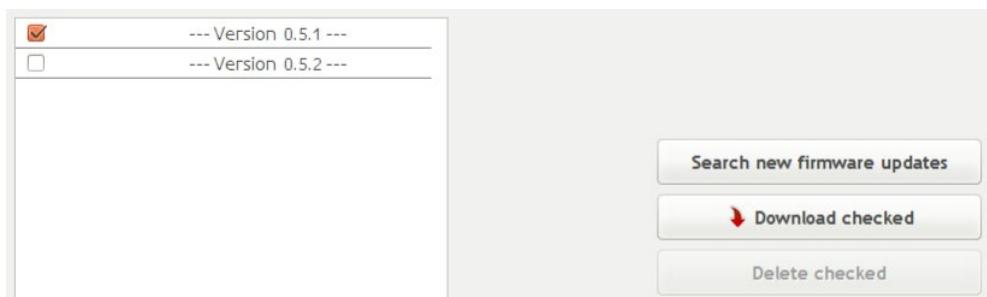


Figure: Firmware download

## Step 6: Burn the new firmware

When this item is downloaded, a disk icon will be displayed near it. Once the firmware is downloaded, it is ready to be installed using the “Install Firmware” section at the bottom. In the drop-down will Appear all downloaded versions. Select one and then hit on “Install” button.



Figure: Firmware downloaded

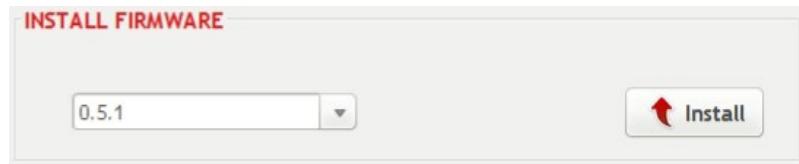


Figure: Firmware selected

## Step 7: Optional – Deleting firmware

You can also delete the downloaded firmware marking the check from the list  and then clicking on “Delete checked” button.



Figure: Delete option

**WARNING:** DO NOT UNPLUG MySignals WHILE IT IS BEING UPGRADED OR IT MAY BE RENDERED USELESS! (THIS CASE IS NOT COVERED BY THE WARRANTY)

## 9. Documentation Changelog

### Version 0.0:

- Basic documentation generated for MySignals Software Development Platform.

## 10. Documentation Changelog

### Version 0.0

- Basic documentation generated for MySignals Software Development Platform

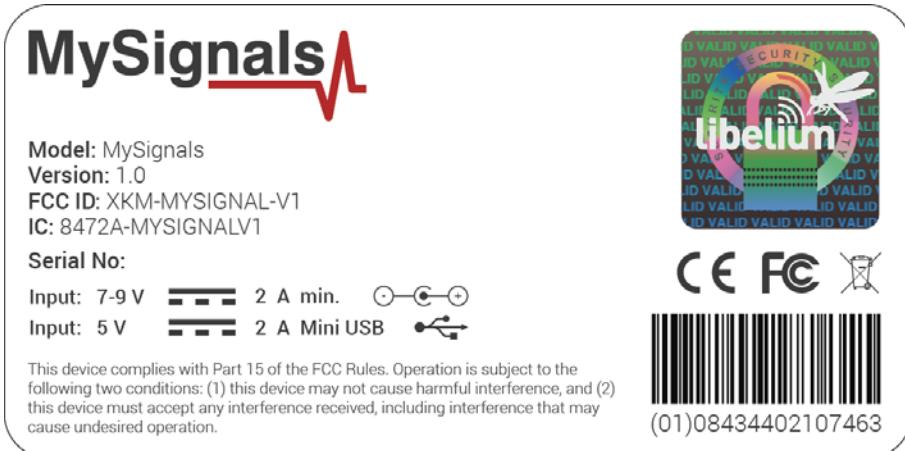
### Version 4.6

- It is indicated that the wireless body temperature sensor (BLE) is no longer available since May 2018

## 11. Certifications

My Signals SW is the first eHealth development platform to be fully certified. The user will benefit from a ready-to-work platform which is prepared and market-ready for the main regions on the world:

- CE (Europe)
- FCC (USA)
- IC (Canada)



Certifications identifiers:

- CE
- FCC ID: XKM-MYSIGNAL-V1
- IC: 8472A-MYSIGNALV1



Figure: Logos for the certifications obtained

## 12. Maintenance

- In this section, the term “MySignals” encompasses both the MySignals device itself as well as its sensors and extra components.
- Take care when handling MySignals, do not let it fall, knock it or move it suddenly.
- Avoid having the devices in high temperature areas as it could damage the electronic components.
- The sensors should be connected carefully. Do not force them when plugging in or out them as the connectors could be damaged.
- Do not use any type of paint on the device, it could harm the operation of the connections and closing mechanisms. Do not remove the permanent plastic frame which protects the screen.
- Remember that the warranty policy does not allow to open the enclosure or any sensor in any case.
- NEVER submerge the device in any liquid.
- Keep the device in a dry place and away from any liquids that might spill.

## 13. Disposal and recycling

- In this section, the term “MySignals” encompasses both the MySignals device itself as well as its sensors and extra components.
- When MySignals reaches the end of its useful life, it must be taken to an electronic equipment recycling point.
- The equipment must be disposed of in a selective waste collection system, and not that for urban solid residue. Please manage its disposal properly.
- Your distributor will inform you about the most Appropriate and environmentally friendly disposal process for the used product and its packaging.



Figure: Disposal and recycling