

Edge Controller User Manual

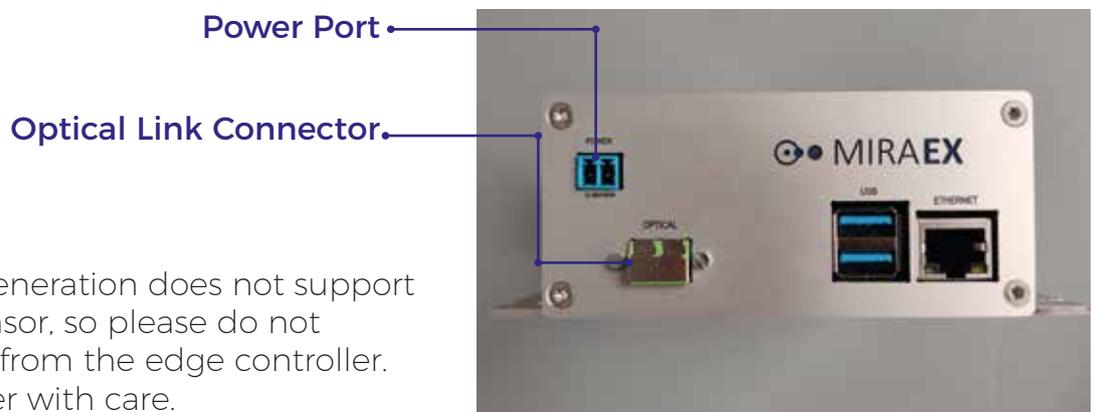
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1. Wiring Up the Edge Controller :

To power up the Miraex edge controller, simply connect the power supply to the power port (see image below - make sure to connect to the correct port). If a non-Miraex power supply is used, please respect the polarity as indicated on the image below.



The current product generation does not support inter-changing the sensor, so please do not disconnect the sensor from the edge controller. Handle the optical fiber with care.

2. Connecting to the Edge Controller setting interface :

Before connecting, make sure you have the edge controller device ID (miraex-ec-021[XXX]). The ID should be printed on the edge controller itself, or have been communicated to you by your Miraex contact upon delivery.

Connect one end of an ethernet cable to the ethernet port of the edge controller and the other end to a computer which can run a browser. Once connected, go to the browser and navigate to the Miraex Controller page on [http://miraex-ec-021\[XXX\].local*](http://miraex-ec-021[XXX].local*). You should now see the page below. This gives you access to the settings of the Miraex edge controller, as explained in the next paragraphs.



*The extension can be .local but could also be .lan . Contact your IT administrator for help.

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3. Setting Up the Wifi :

The WiFi settings page is divided into 3 distinct sections.

Activation/Deactivation of the WiFi chip :

Miraex recommends using a wired connection for the Edge Controller. WiFi radio waves can generate artefacts in the acquisition circuitry. Noise levels will increase and some isolated peak bursts can be seen whilst measuring with the WiFi chip on.

Wired Connection :

When using the Edge Controller in a wired configuration

1. Untick Activate WiFi chip and click on Apply Changes.
2. After having seen the confirmation message, reload the page.
3. Ensure all boxes on the page are unticked.
4. Deactivating the WiFi does not require rebooting the Edge Controller.

Wireless Connection :

**If you are not wired via ethernet
DO NOT DISABLE THE WIFI CHIP**

Note that if you are not wired and untick Activate WiFi chip you will lose the contact with the Edge Controller forever as the WiFi hotspot will be deactivated. **There is no way to recover from that.**

To use the Wireless connection, you need to configure the WiFi network. See Connection to an external WiFi network (CLIENT MODE)

WiFi Access Point settings

This section is used for configuring the WiFi Access Point (AP).

You can change the Hotspot name and password.

1. Change the **AP Wifi network name**.
2. And/Or change the **AP Wifi network password**.
3. Click on **Submit**.
4. Wait for the confirmation message and reload the page.
5. Check the changes are effective on the page.
6. Scan the WiFi networks on your computer, you should see the new Hotspot name.

WiFi AP Configuration

Miraex controller can provide its own WiFi network in case you want to talk to it in an environment without internet access and/or without linking it to your PC via an ethernet cable.

Activate WiFi access point

Activate on system startup

AP Wifi network name

miraex-gen2-board116_AP

AP Wifi network password

9qLLFqyEsjps

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Other Options :

Activate WiFi access point : enable/disable the WiFi hotspot until next reboot of the Edge Controller

Activate on system startup : enable/disable the WiFi hotspot permanently on the Edge Controller

Connection to an external WiFi network (CLIENT MODE) :

In the scenario you cannot use the Edge Controller with an ethernet connection, Miraex provides you the ability to connect the Edge Controller to a wireless network.

1. Fill in the Wifi network name.
2. Fill in the Wifi network password.
3. Tick Connect to Wifi.
4. Click on Apply changes.
5. Wait for the confirmation message and reload the page*.
6. Reload until you see an IP address in the field Current IP address.
7. Go to the Reboot tab to restart the Edge Controller. Wait 1 min30 to 2min
8. Verify that you can reach [http://\[Current IP address\]](http://[Current IP address]) in your web browser**. If the page is not reachable, wait an extra minute and refresh the page. If there is still nothing. Repeat steps 7/ and 8/ once. If there is still no interface available, contact your Miraex representative.

This Current IP address corresponds to the IP address of the Edge controller WiFi interface.

WiFi Network

Miraex controller can connect to an existing WiFi network. Enter the network name (SSID) you want to connect too and its password.

Wifi network name

Wifi network password

Connect to WiFi

Current IP address

Apply changes

*If your web browser tells you "This page does not exist", keep refreshing for the next 5-10 sec. It should solve the issue.

**Your computer needs to be connected to the same network as the one the Edge Controller is connected to.

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DO NOT USE SIMULTANEOUSLY A WIRED CONNECTION (ETHERNET) + WIFI CONNECTION TO A NETWORK.

USING WIFI INSTEAD OF ETHERNET DETERIORATES THE USER EXPERIENCE AND RELIABILITY. DATA RATE OUTPUT MIGHT BE SLOW, THE VISUALIZER WILL BE CLOSE TO BE UNUSABLE.

4. TCP/IP settings :

The Edge Controller can request a connection to a network via two means. It either:

- lets the modem/router DHCP provide the IP address to it (default).
- requests a connection with a static IP set by the user.

In static IP mode, the IP requested needs to be non-allocated for being valid.

Usually, in DHCP mode, as long as the IP is not in use already, the router gives the same IP address to an already known device. Typically, if your network is small, the IP given by the DHCP should never change.

Interface IP address :

The IP addresses displayed in the two fields **Current address Ethernet** and **Current address WiFi** correspond to the IP addresses of each of the wired and wireless interfaces. Nothing is displayed in one interface's field if it is not connected to a network via this interface.

IP Config

Dynamic (DHCP) or static IP settings

► Details

Current address Ethernet

192.168.1.160

Current address Wifi

New address for Ethernet (set to 0.0.0.0 if DHCP is on)

0.0.0.0

New address for Wifi (set to 0.0.0.0 if DHCP is on)

0.0.0.0

IP Config

Dynamic (DHCP) or static IP settings

► Details

Current address Ethernet

192.168.1.160

Current address Wifi

192.168.1.159

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Switching between DHCP or Static IP

By default, the Edge Controller lets DHCP decide which IP address to give to its connected interfaces. If it is the case, the input should be 0.0.0.0 .

If you want to set a static IP, just type the IP you want in the corresponding field

New address for Ethernet (set to 0.0.0.0 if DHCP is on)

0.0.0.0

New address for Wifi (set to 0.0.0.0 if DHCP is on)

0.0.0.0

Using static IP mode is an advanced setting:

- you cannot request the same IP for both Ethernet and WiFi interface.
- the IP you are requesting must be available.
- Check the IP you are entering is within your IP subdomain range.

5. Setting the NTP server

Through the NTP config page, the edge controller allows you to set a remote NTP server for time synchronization.

Enter the server address, submit, and time will be synchronized as soon as possible with the given NTP server. If the NTP server is not available, the default NTP server will be used (requires internet connection for synchronization).

NOTE: default time zone is Paris/Zürich.

NTP Config

Address

Submit

6. Viewing and recording data in Miraex Local Viewer :

Miraex recommends the use of the following browsers : Chrome/Chromium-based browsers/Safari. It has not been tested with Internet Explorer. Performance with Microsoft Edge or Firefox are not optimal.

Always keep the visualizer browser tab active when using it. This software is quite demanding in resources for both the Edge Controller and the client computer. If the browser tab becomes inactive (browser hidden or not the foreground app running), the visualizer will stop itself after 30 seconds.

Introduction

A live data viewer can be started on the Edge Controller. It can be accessed by:

- Clicking on the tab menu **Data Viewer & Recorder**.
- Once on the tab page, select **AC channel** and click on Start Visualizer.

It redirects to a new webpage. Sometimes, the visualization takes a long time to start and you might have to refresh the page for 5 to 10 seconds maximum before seeing something on the screen.

This local viewer displays three graphs:

- the raw signal measured by the sensor,
- the vibrational spectrum
- the RMS values of the signal.



In addition to a live streaming of the data, there is the possibility of recording the raw measurements and/or RMS values. Recorded data are put into a .csv formatted file and are directly streamed on your computer while recording is active.

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Viewer controls

- The livestream can be paused and resumed by clicking the Pause/Resume button.
- The visualizer stops with a click on Quit and return to the edge controller interface.
- Through interaction with the graphs, one can zoom on the signal or select a part of the signal (see tools when hovering over the graph). One can also download a picture of the graph (top right).

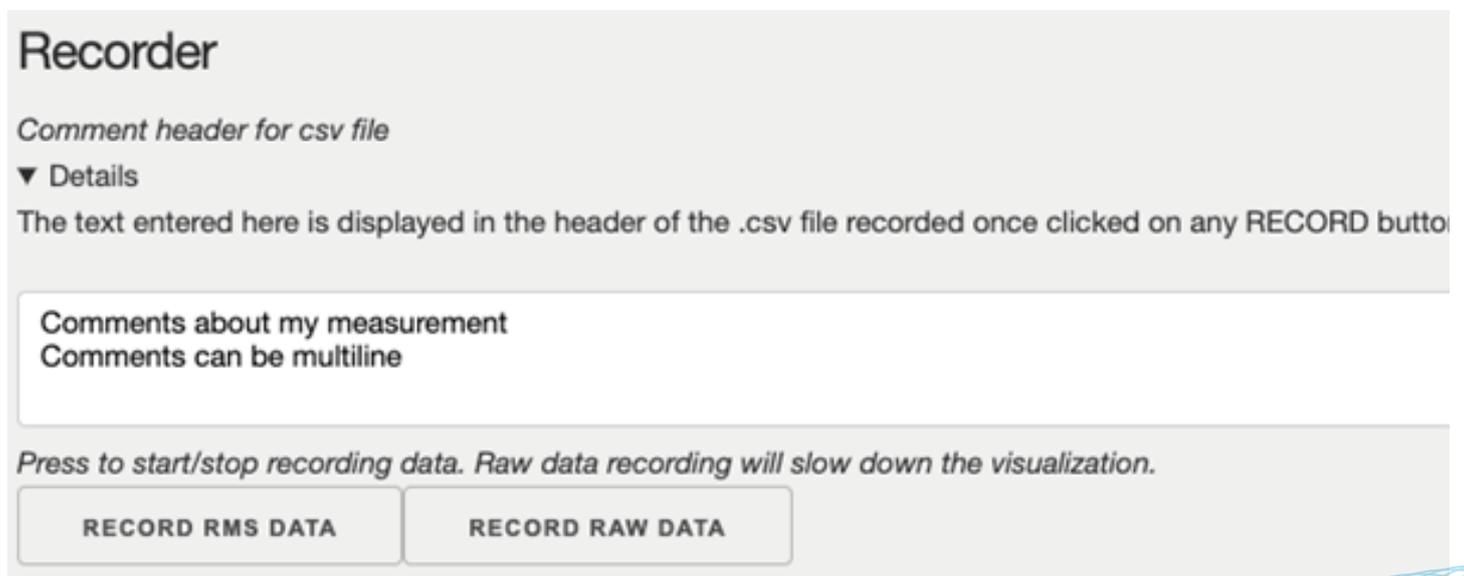
Using the data recorder

- Put a comment for the incoming recording. This comment will be added to the top of the .csv file
- Click on any of the two record buttons depending whether you want to record raw signal or RMS signal.
- Your web browser will ask you where to download the recorded file. Once set, the recording will start and data will be streamed in this file. When recording both RMS and raw data, two different files are streamed.
- The file naming convention is the following :

Raw data file : **YYY-MM-DDTHH_MM_SS.MS_raw_recording.csv**

RMS data file : **YYYY-MM-DDTHH_MM_SS.MS_rms_recording.csv**

Example of recording with comments :

A screenshot of the "Recorder" interface. At the top, the word "Recorder" is displayed in a large, bold font. Below it, the text "Comment header for csv file" is shown. A dropdown menu labeled "▼ Details" is visible. The main text area contains the instruction: "The text entered here is displayed in the header of the .csv file recorded once clicked on any RECORD button". Below this is a text input field with the placeholder text "Comments about my measurement" and "Comments can be multiline". At the bottom, there is a warning: "Press to start/stop recording data. Raw data recording will slow down the visualization." and two buttons: "RECORD RMS DATA" and "RECORD RAW DATA".

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Raw data files will only contain the data points. Timestamps can be reconstructed as the starting time is given and the sample rate is 64 000 Hz*.

```
#BEGINNING OF FILE
# Recording start time: 2021-11-22T16:27:32.331803
# Comments about my measurement
# Comments can be multiline
# raw value
-6.152228538834988
-6.125431541111944
-6.0952415213966935
-6.061842295964476
-6.025432993026652
...
#END OF FILE
```

RMS data files will look like:

```
#BEGINNING OF FILE
# Recording start time: 2021-11-22T16:27:31.060383
# Comments about my measurement
# Comments can be multiline
# timestamp, rms value
2021-11-22 16:27:31.076377,5.1960096702168945
2021-11-22 16:27:31.301536,5.196009670216893
2021-11-22 16:27:31.563192,5.196009670216875
...
#END OF FILE
```

NOTE: The presence of the flag #END OF FILE ensures that the recording stopped properly and no data is missing.

*Raw data files are huge, not including timestamps saves a lot of storage.

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Spectrum viewer :

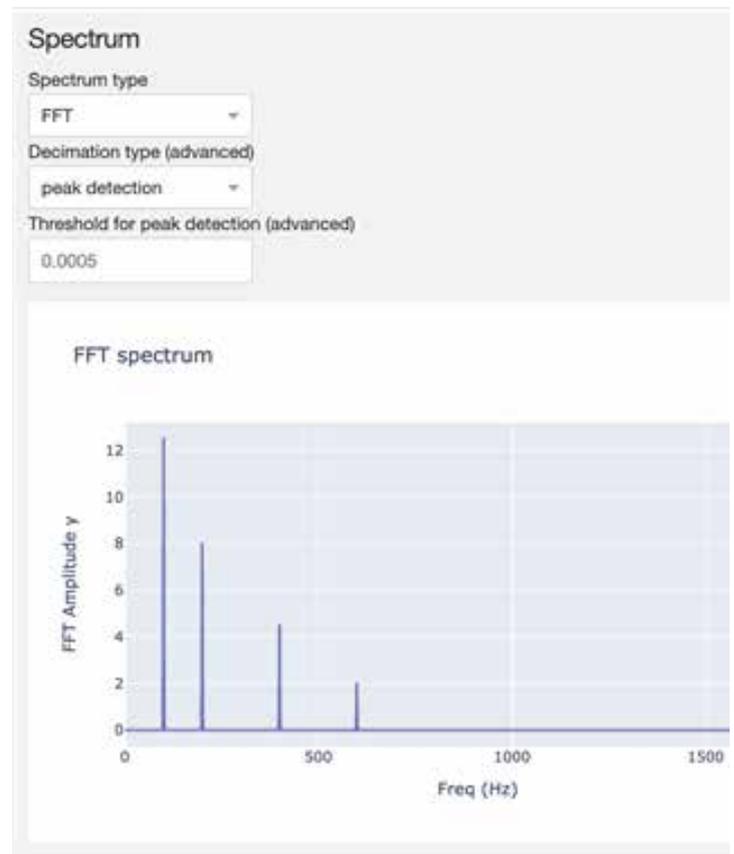
Spectrum type :

Depending on your habits, you can visualize the Fast-Fourier Transform (FFT) or the Power Spectral Density (PSD) of the signal. For both, you can either display in linear or log scale (dB).

Decimation type :

FFT/PSD are calculated over 64000 points (i.e. over the last second of data measured). The resolution obtained is 1 Hz but the spectrum displayed in the web browser is decimation. Straightforward decimation means loss in resolution. Miraex additionally offers **peak detection** mode which is a combination of straightforward decimation + peak detection according to a threshold value to define a peak.

- When selecting classic decimation, the resolution will be 4Hz, the background noise will be shown in the plot but the fluidity of the rendering will be low and some peaks could be missing.
- When selecting peak detection decimation, the resolution will be 16Hz outside of peaks. All peaks satisfying the threshold will be shown and will have a 1Hz resolution 3 points before and after the prominence of the peak. Rendering speed will be much better. On the other hand, background noise resolution will be lower and setting the threshold value can be difficult*.



*A too high threshold will miss peaks, a too low threshold will take background noise as peaks.

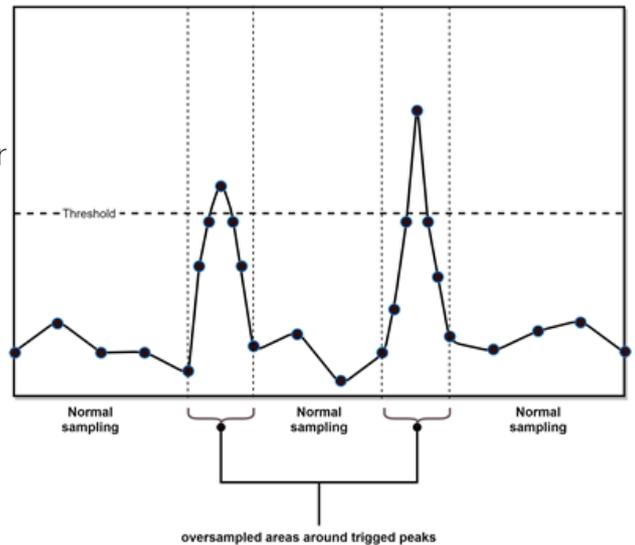
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Rms viewer :

RMS values are very important and simple data to look at for vibrational signals. 4 values are calculated and displayed every second. The averaging period for each RMS value is configurable.

RMS averaging period :

The RMS averaging period is configurable and can be set from 200 ms to 2000 ms. Using small averaging periods is advised when the user wants to look at prompt events. Long averaging periods are better for monitoring the stability of a system.



Known limitations and issues of Miraex web browser visualizer :

Live Streaming plots in a web browser is still an experimental feature. Performances are not necessarily optimal and will depend on your web browser version and CPU/GPU.

While developing and testing the feature, the following unexpected behaviors and limitations have been observed and can thus occur:

[Issue] The rendering of the amplitude stream can be jittery*.

[Issue] Discontinuities appear in data if the viewer tab is put in the background.

[Issue] Too many other opened tabs in the browser can make the rendering too slow**.

[Limitation] There is a small latency on the signal as data needs to be buffered.

[Limitation] The viewer must only be opened once (one tab only, in one browser only)

[Limitation] If the latency increases because of poor rendering performance, data frames will be dropped. You won't see the whole signal.

[Limitation] To avoid performance issues, raw signal is downsampled by a factor 20. The displayed signal can then be highly distorted if compared with the pure signal sampled at 64 kHz.

We are working hard on improving these points and hope to release a new version soon. Any feedback from your side will be welcomed by Miraex IT team.

*Highly depends on the web browser used.

**The number of tabs depends on your CPU and RAM setup.

7. Sending data over TCP/UDP socket :

Setup :

Calibrated and compensated raw data are directly accessible via TCP or UDP socket.

- Fill the socket server IP address and port.
- Set the socket type field. UDP is preferred for the bandwidth required.
- Current Status will tell you the current state of the service.

Payload :

The payload is just a suit of bytes with no separators. Each float is 4 bytes encoded*.

Streaming the following four floats **1.0, 0.0, 1.0, 0.0** will give:

?\x80\x00\x00\x00\x00\x00?\x80\x00\x00\x00\x00\x00

Socket Streamer

Set the socket ip, port and type you want to use, then start the streamer. Sends raw data without timestamps to a TCP or UDP socket.

IP:

Port:

Type:

Current status:

START SOCKET STREAMING

*Miraex can provide custom payloads to satisfy customers needs.

8. Sending Data Over MQTT :

It is possible to send RMS-values of the sensor data to an MQTT broker.

To activate the MQTT publisher, enter the details (address, port, topic, interval) on the MQTT Config page, check the MQTT-checkbox and submit. The MQTT client will try to connect.

To validate if the connection is established, go back to the MQTT Config page to see if the MQTT checkbox is still checked. If not, the client failed to connect. Please verify your settings and re-submit.

Each interval (in seconds), the client will acquire 1 second of buffered data, calculate the RMS value and send the result to the broker. The payload of the message contains the timestamp and the RMS value, separated by a semi-colon (e.g. '1606414843.756982;0.201').

Optionally, a bandpass filter can be applied to the data, before the RMS value is calculated. This can be activated through the Filter menu (see paragraph 'Setting a filter for aggregated data').



The screenshot shows a web form titled "MQTT Config". At the top, there is a checkbox labeled "MQTT" which is checked. Below this, there are four input fields: "Broker address" with the value "test.mosquitto.org", "Port" with the value "1883", "Topic" with the value "sensor1", and "Interval" with the value "3.0". At the bottom of the form is a blue "Submit" button.

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9. Sending Data To the Miraex Cloud Viewer :

If the edge controller is connected to the internet, it is possible to automatically send measurements (i.e. filtered RMS-values of the sensor data) to the Miraex Cloud, which enables viewing and downloading measurement data through the Miraex Cloud Viewer. This requires a Miraex Cloud Viewer account (please contact your Miraex contact for more information and tutorials).

To enable connection to Miraex Cloud, tick the box next to 'Miraex Cloud Connect (on/off)' and submit. The edge controller will then try to connect to Miraex Cloud, if an internet connection is available. To restart the connection (in case of issues), uncheck the box + submit and re-check the box + submit.

Miraex Cloud Connect Config

Miraex Cloud Connect (on/off)

Activate on system startup (on/off)

Submit

To enable connection to Miraex Cloud upon start of the device, check the box next to 'Activate on system startup (on/off)' and submit. Optionally, a bandpass filter can be applied to the data, before the RMS value is calculated. This can be activated through the Filter menu (see paragraph 'Setting a filter for aggregated

Miraex Cloud Connect + Miraex Cloud Viewer :

When Miraex Cloud Connect is enabled, the device can be controlled remotely through the Miraex Cloud Viewer. This means that through the Miraex Cloud Viewer

- the functionality to send measurements can be activated (or deactivated), i.e. the device only sends data when it is activated in Miraex Cloud Viewer and Miraex Cloud Connect is enabled)
- the measurement period between different data points can be set (in seconds)
- the measurement name can be set, to group measurement data points in the Miraex Cloud Viewer



Device config controls

Active: Yes

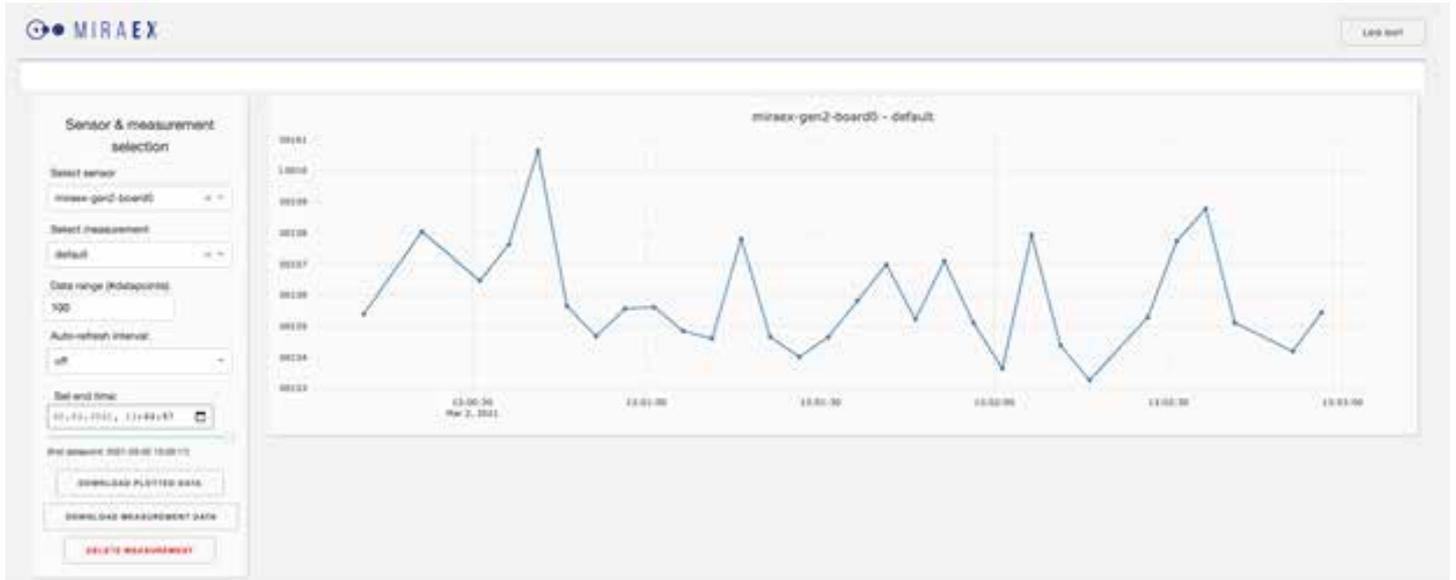
Measurement period (seconds): 10

Measurement name (lowercase, no spaces): default

SUBMIT CONFIG

Change config values and press submit to send to device.

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Preview of measurement data streamed to Miraex Cloud Viewer

10. Setting Filter for Aggregated Data :

Optionally, a bandpass filter (5th order Butterworth) can be applied to the data, before the RMS value is calculated (that is sent to your external MQTT Broker or Miraex Cloud). This can be activated by checking the 'Filter' checkbox, filling in the appropriate high- and low cut frequencies and clicking submit.

Filter Config

Filter

Bandpass Filter lowcut (Hz)

Bandpass Filter highcut (Hz)

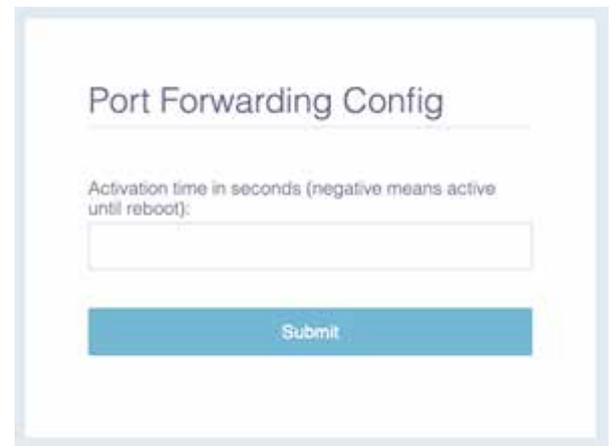
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11. Enabling Port Forwarding For Support :

To provide you with the most optimal support when facing issues, it is possible your Miraex representative requests you to enable Port Forwarding. This feature allows secure remote access to the edge controller from the Miraex server.

Port Forwarding requires an active internet connection.

To activate Port Forwarding, enter an activation time and submit. This will allow connecting securely for the given time interval (in seconds). When the interval is passed, no new connections can be set up. To activate Port Forwarding until reboot, enter a negative number.

A screenshot of a web form titled "Port Forwarding Config". It contains a text input field with the placeholder text "Activation time in seconds (negative means active until reboot):" and a blue "Submit" button below it.

Port Forwarding Config

Activation time in seconds (negative means active until reboot):

Submit

12. Rebooting the Edge Controller :

To activate Port Forwarding, enter an activation time and submit. This will allow connecting securely for the given time interval (in seconds). When the interval is passed, no new connections can be set up. To activate Port Forwarding until reboot, enter a negative number.

MQTT and Socket streamer will be deactivated after a reboot. All other settings are saved and reloaded.

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13. Specifications :

Hardware	Timing in seconds
Power On	0
Ethernet	25
WiFi	45
Miraex System and software	
Web Interface	50
Acquisition	60
Full Reboot*	75 to 85

14. Support :

For support, please contact your Miraex representative.

End Of The Document

*Until Acquisition is started again