DEWESoft®

Simple Measurement Using Dewesoft DAQ Hardware

How to Install the Dewesoft X Software?

First, we need to install Dewesoft X on the computer. You have to download Dewesoft X software from our download page. Download and run the Installer. Dewesoft X supports the operating system Windows, Version 7 (32-bit and 64-bit), and newer.

Licensing

- The license for measuring with Dewesoft X is included in the device (usually PROF version). Once it is connected on the USB port, it acts as a dongle.
- The license for analysing is free! Dewesoft X can be installed on any computer and the stored data files can be opened, recalculated, and exported.
- Additional licenses can be required for plugins, these can then also be written into the DewesoftÂ® device. To test plugins, you can request a 30-days-Evaluation license.

More information about licensing can be found here. On the following link, you can also find the information about plug-in installation and registration.

Which Equipment will be used for demonstration?

In this simple measurement lesson, we will show a simple measurement of various sensors using Dewesoft SIRIUS system. One sensor after the other will be connected and a basic measurement will be done. It makes sense to work this through from the start to the end, as with each measurement more details and different instruments and functions are shown. In the picture below, you can see the demo equipment that was used.

Image 1: In following tutorial the Dewesoft Sirius device will be coupled together with an acceleration sensor, tuning fork and encoder

The demo kit consists of the SIRIUS device, with its installation USB stick and the three sensors:

- Acceleration sensor
- Tuning fork
- Encoder

How to Connect the SIRIUS device?

Dewesoft X Launcher

When we connect the ***power and USB connector to the computer***, Dewesoft X will pop out from the auto-detect the screen and show the devices with their serial number, the status of power supply, and the status of the synchronization cables in case we have more than one unit connected. Pressing Run Dewesoft will close the popup and start Dewesoft X software.

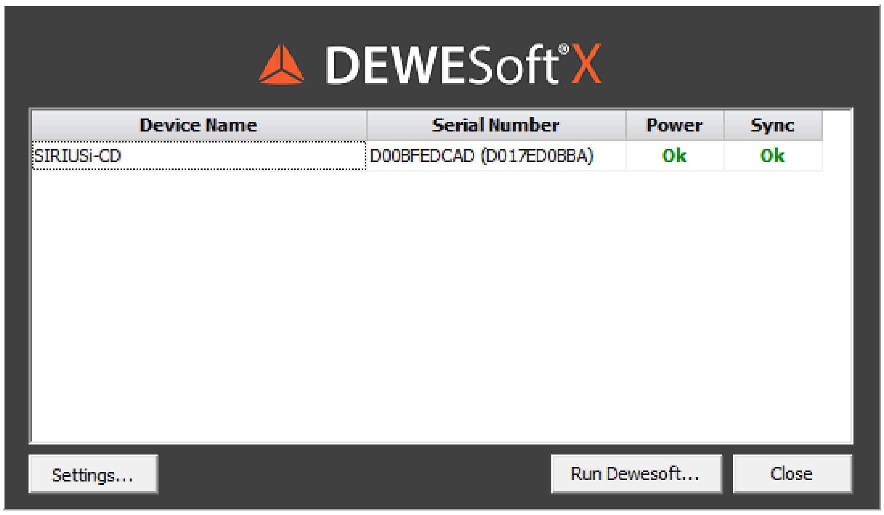


Image 2: Dewesoft will auto-detect connected Dewesoft Hardware

Manual setup of hardware

In case you need to manually set up the hardware, please start Dewesoft X and go to **Options - Settings**.

Under **Devices**, set the *operation mode* to **Real measurement**. Then s*can for the hardware with the refresh* *button*. The SIRIUS will be found with the according to the serial number.

For more informations about Settings, visit the How to set up the Dewesoft tutorial.

When you confirm the Settings, you should get the **Channel Setup** screen in the Measure mode, *showing the instrument with the built-in amplifiers*.

Notice, the two buttons on the left upper corner **Measure** and **Analyse**. One mode is for *storing the data*, the other is for *reloading data files and analyzing them.*

How to connect the Acceleration sensor?

We connect an IEPE accelerometer on the first channel.

Image 3: Connected acceleration sensor to the Dewesoft SIRIUS device

First, think about the required sampling rate. What is the highest input frequency we expect? In the drop-down "Dynamic acquisition rate" the default value is usually 20 kS/s, which is fine for now.

If not already set, activate the channel by setting it to Used.

As the SIRIUS-ACC amplifier supports two input modes, in the row of the first amplifier please set the "Measurement" from Voltage to "IEPE", so the amplifier will supply the sensor. If the "Ampl. name" (and the LED ring on the instrument around the BNC connector) gets green after a few seconds, we know that the sensor impedance is OK.

Then enter the Channel setup window by pressing the "Setup" button.

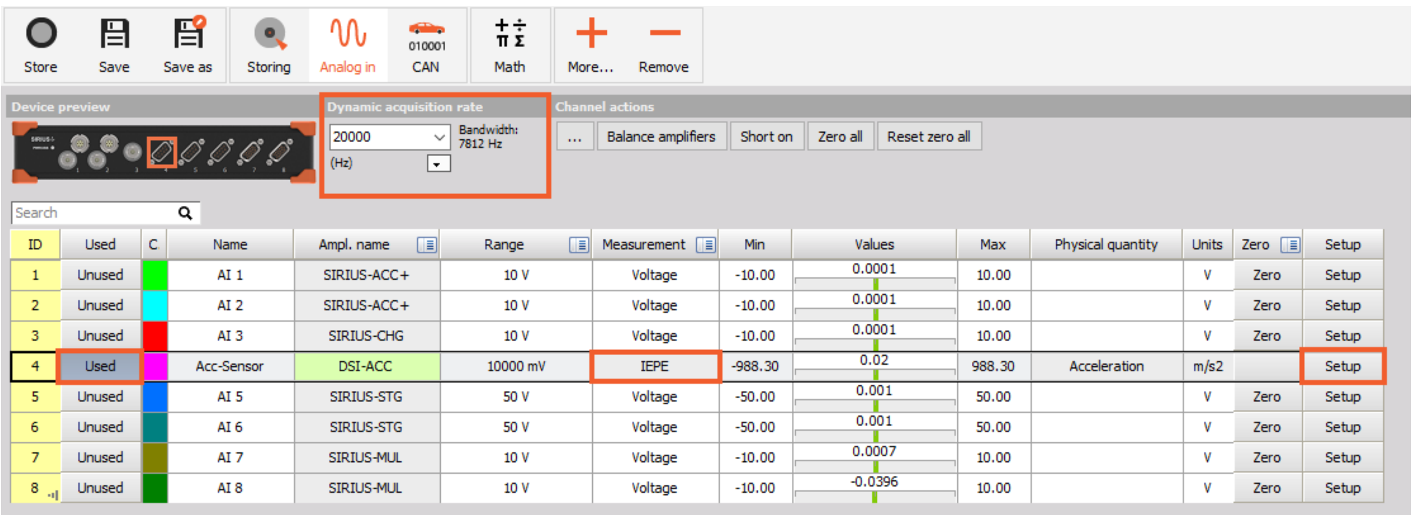


Image 4: Connected acceleration sensor is shown in a Channel setup under the 'Analog in' tab in the Measure mode of Dewesoft X software

Channel setup

The Channel setup window splits up into left (Amplifier settings) and right (Sensor settings) side. Furthermore, you can change the name

- **Amplifier settings** - With the Dual core option set (if you own a Dual-core SIRIUS), we don't have to care about the input range. On the bottom you see a quick preview of the sensor signal, knock on the accelerometer for testing.
- **Sensor settings** - In our case the accelerometer has built-in TEDS (transducer electronic data sheet), so automatically all the calibration factor and calibration data (by the way: out of date, see red warning) is read from it. In any other case - Enter the Physical quantity (Acceleration) and the Unit (either g or m/sÂ²) and the calibration factor below, or put the sensor on a reference shaker and press the Calibrate button.

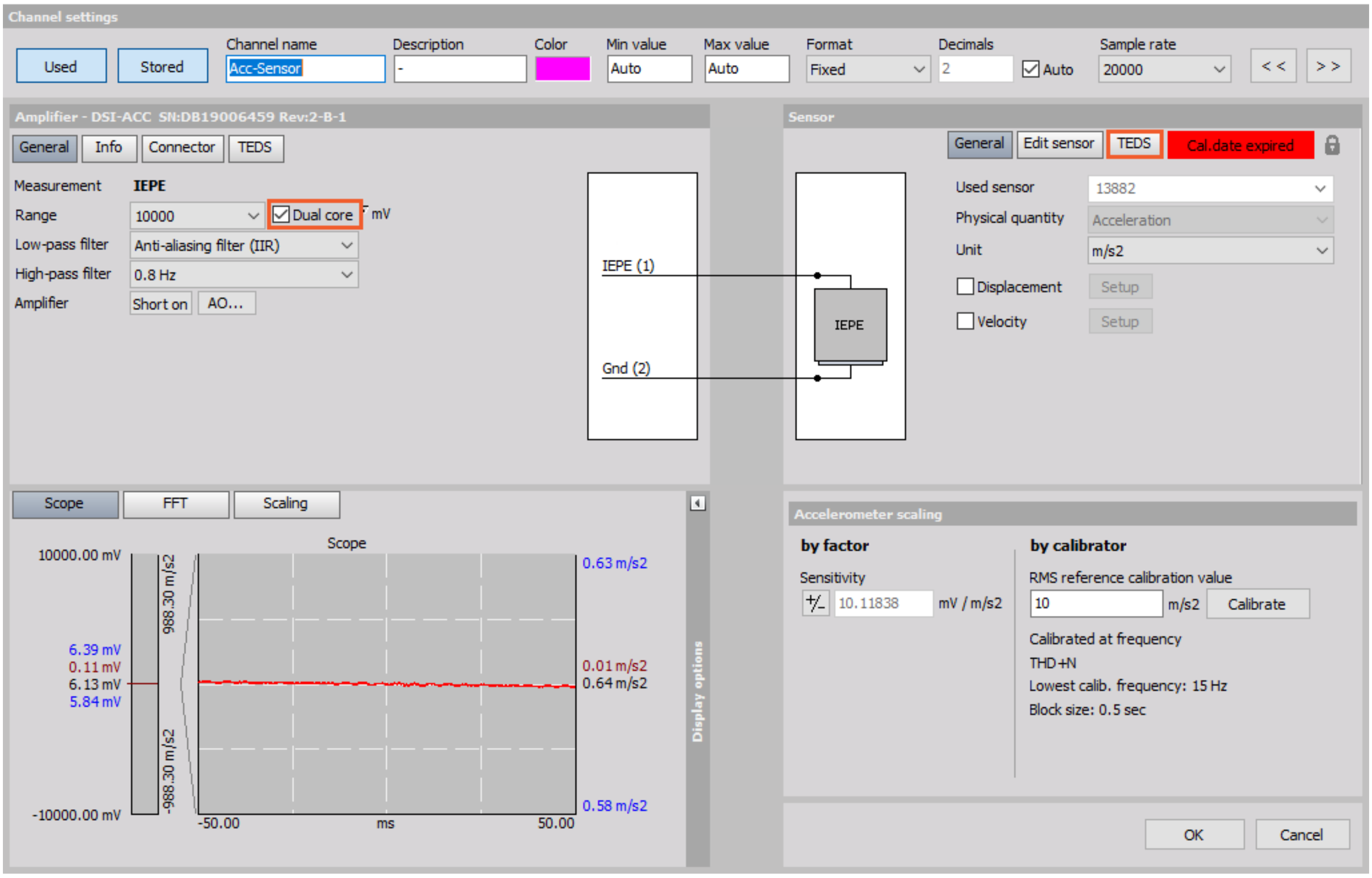


Image 5: Channel setup window

Storing

Before starting the measurement, please go to the **Storing** ribbon, and *specify a file name.* The Storing type is set to always fast, here you can specify trigger conditions later.

Then click the red **Store button** to start storing the measurement.

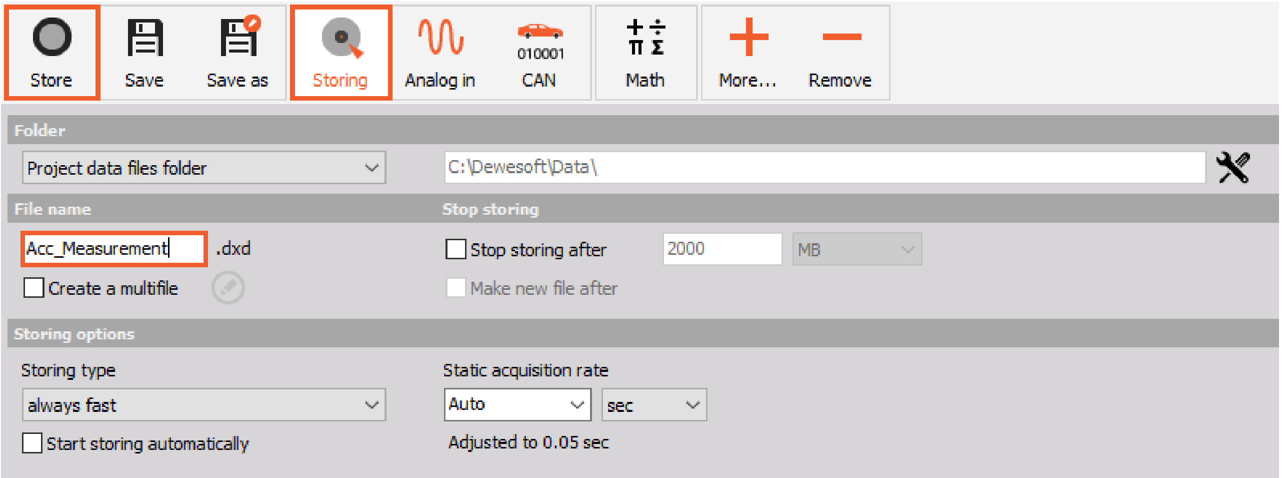


Image 6: In Storing tab set the file name and start storing

Recorder

[Dewesoft X](#) switches to Measure mode. For faster navigation on top, there are 2 screens - **Recorder**, and **Custom...** predefined. The screens contain instruments, and can be freely defined. The Recorder screen currently consists of one Recorder instrument.

Do a few hits on the accelerometer.

Image 7: Display preview in measurement mode

The recorder *y-axis automatically adapts to the currently visible minimum/maximum values,* if the Recorder properties on the left "**Autoscale**" is enabled. On the right side is the channel list, showing the *channel currently assigned* to the Recorder instrument.

After you have done the measurement, please click **Stop**, then change to **Analysis mode**.

Analysis

Let's take a look at the recorded data. You are now in "Analysis mode". The last recorded data file is automatically reloaded. Let's zoom into one of the peaks.

To zoom in, *press the left mouse button, hold it down while moving to the right, then release*. If you move the mouse between the two cursors, there is a small + attached to the mouse icon, and if you click between cursors, the area will be zoomed in.

To zoom out to the previous level again, simply click the right mouse button.

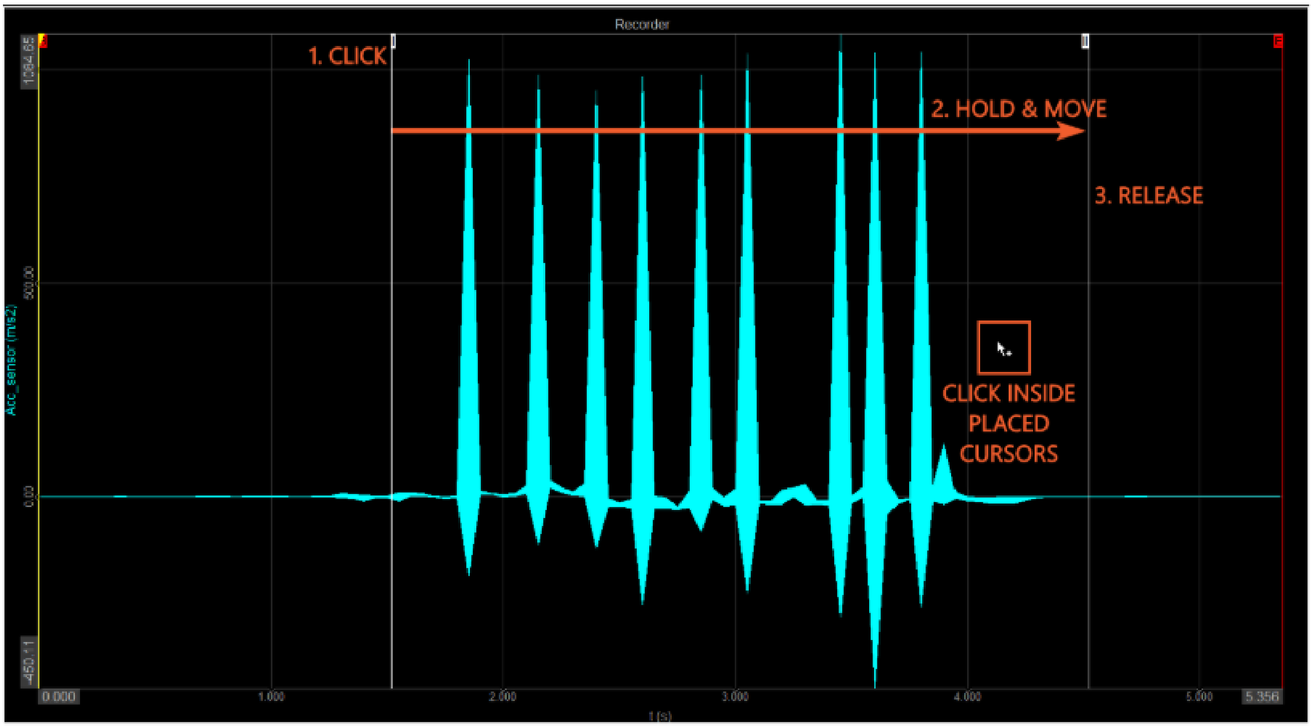


Image 8: Zoom in the area between cursors

You can zoom in until you see the sampling points (20 kHz).

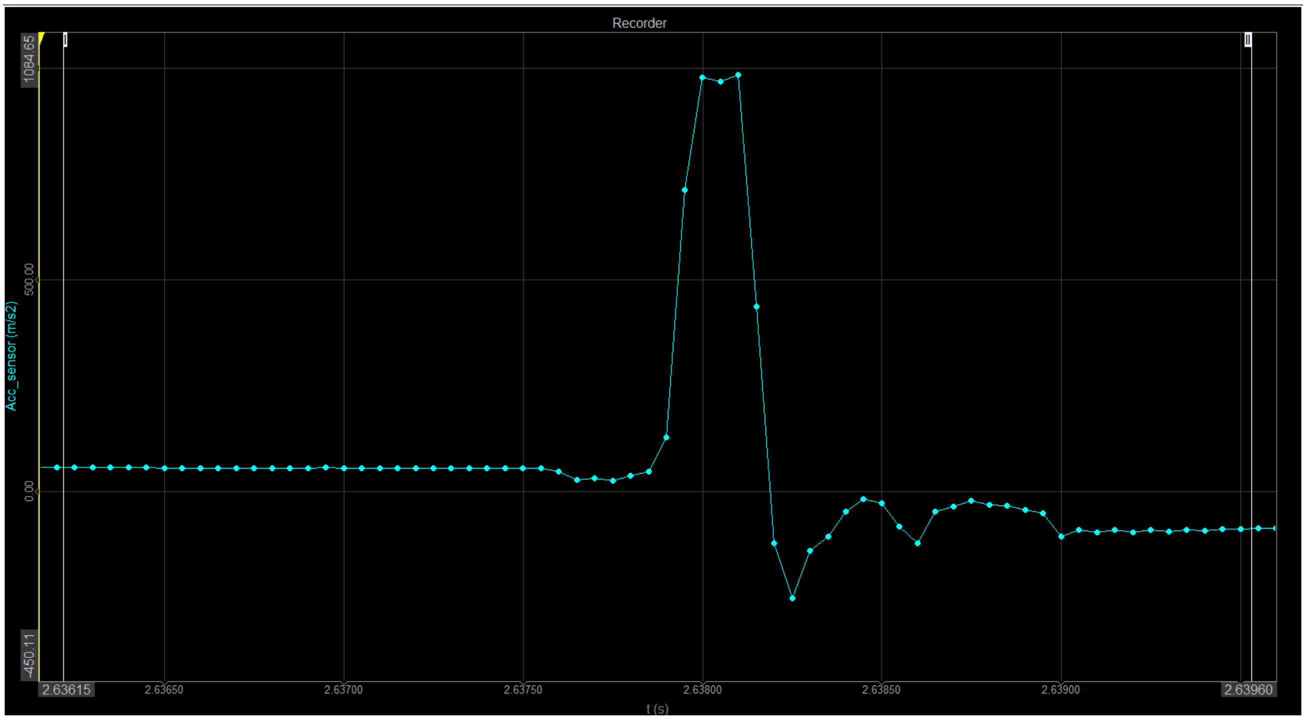


Image 9: Zoom in until you see the sampling points

Export

Only the selected region (in the overview instrument on top) will be exported!

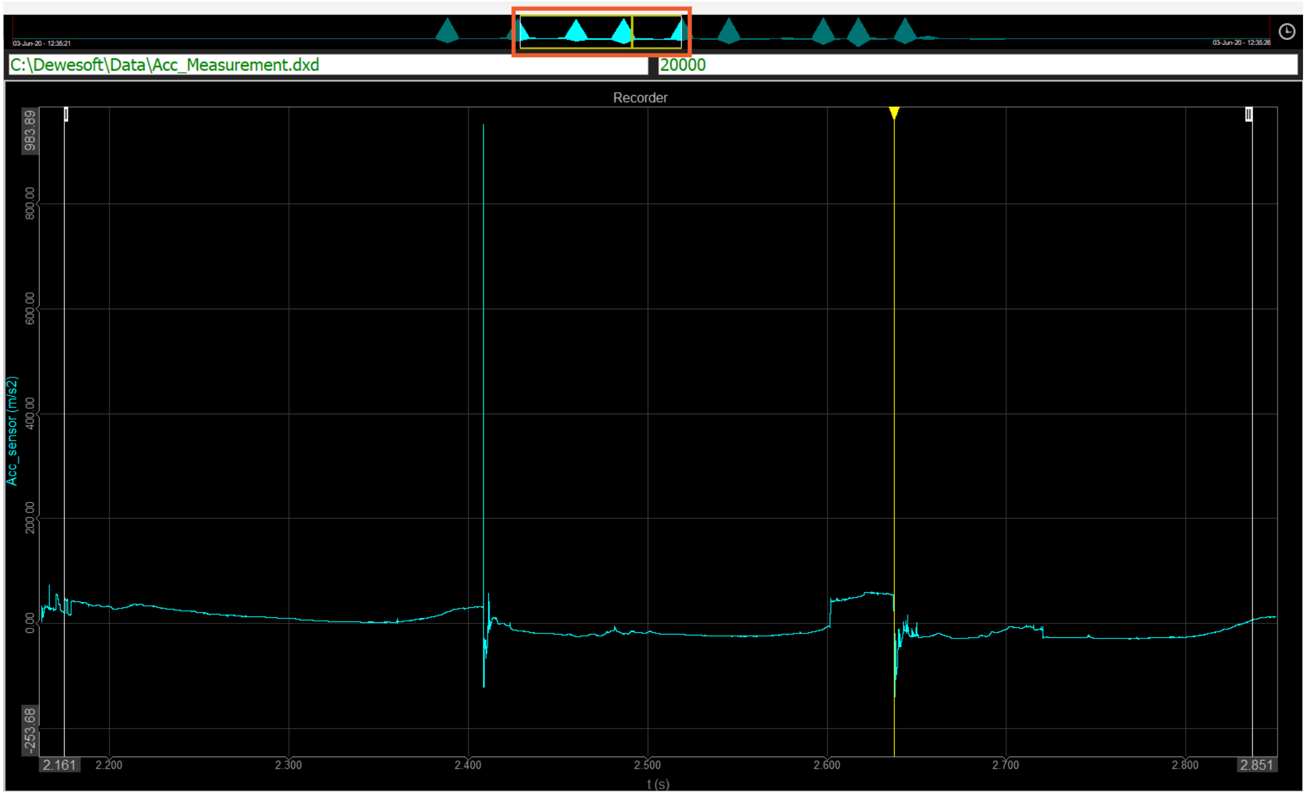


Image 10: Export the zoomed region

Go to the **Export section -> File Export**, chose the file type and properties, enable or disable channels from the right, then click the **Export button**.

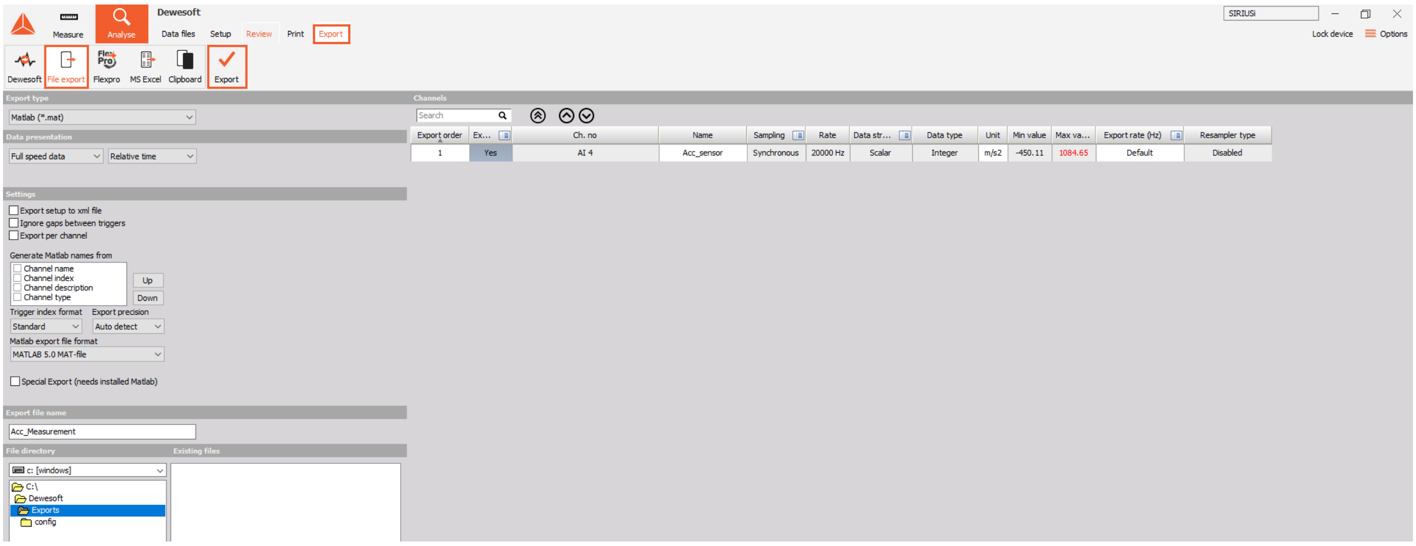


Image 11: Export selected area

The FlexPro and MSExcel Active X ribbons on top will export into a template, which you can adapt, in order to directly export in your finished report.

To learn more about acceleration sensors and vibration measurement, visit Vibration measurement tutorial.

How to measure with Tuning forks or a Strain Gage?

We connect a strain gage on one of the STG inputs of our SIRIUS.

Image 12: Tuning forks with strain gage coupled to the SIRIUS device

A "**tuning fork**" is normally used for tuning the instruments of an orchestra. It is *tuned to 440Hz*, which is the standard pitch (note 'a'). In our demo tool, a quarter bridge strain gage with either *120 or 350 ohms resistance* (is marked on the connector) is mounted on the steel, therefore we can measure the strain of the vibrations.

Image 13: Strain gage and tuning forks specification

Open the Setup of the channel where the tuning fork is connected to.

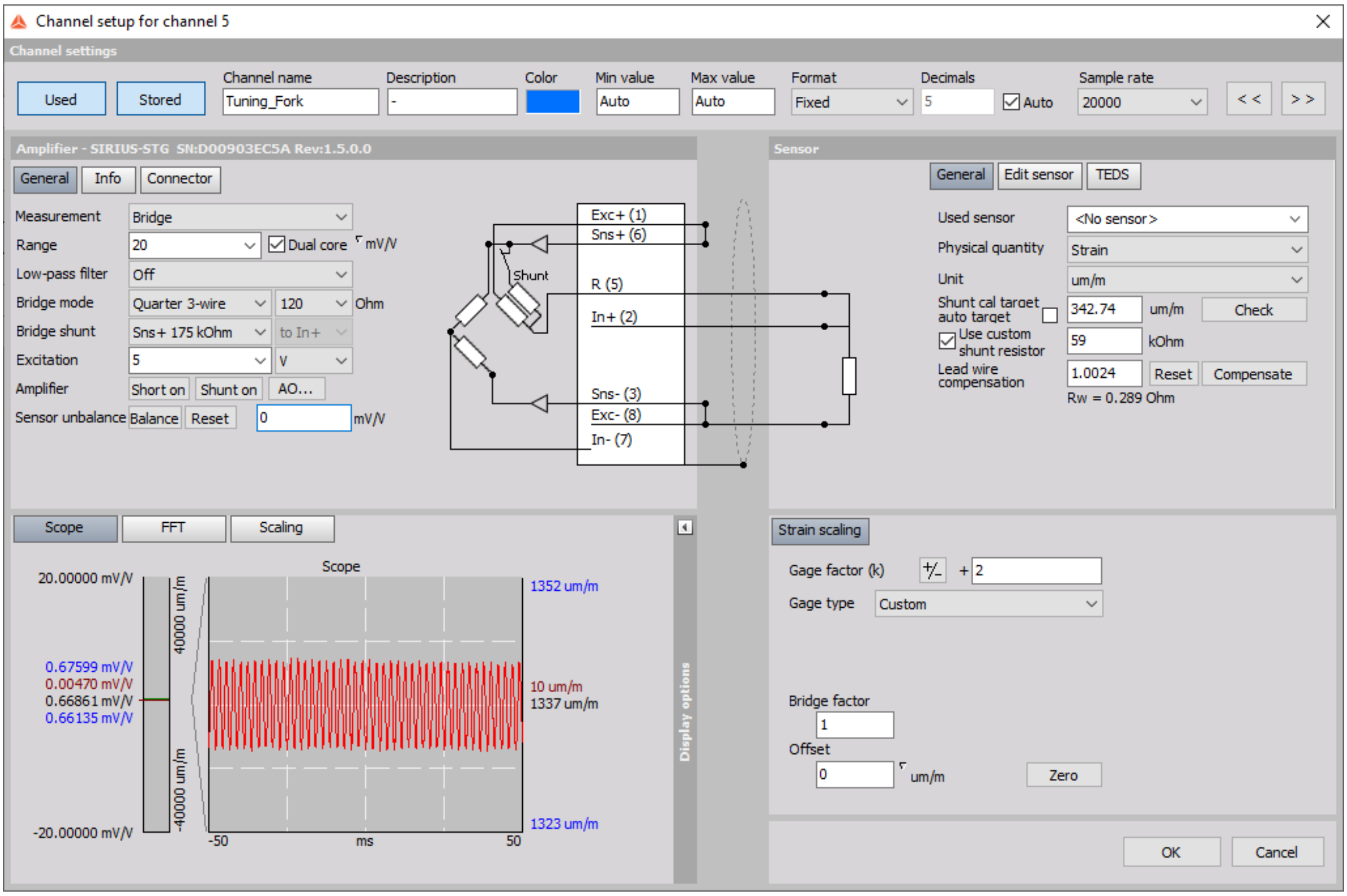


Image 14: Tuning fork channel setup

In the left upper section, we find the amplifier settings. Set to "**Bridge**" and "**Quarter bridge 3-wire**", either *120* or *350* ohm (written on connector). You directly see the according circuitry, how to connect the quarter bridge on the 9pin DSUB connector.

Select an appropriate **range**, if you use the highest, you don't have to care about overload (input voltage exceeding amplifier range). We use a smaller range, e.g. *20mV/V*. The higher ADC is now working in the 20mV/V input range, while the lower ADC input range is 5% of it, 1 mV/V simultaneously, so you get an amazing dynamic.

On the right side - **Sensor settings**, we select Physical quantity *Strain* or *Stress* and the unit. If you have a sensor with a TEDS chip, and all the settings are read from it automatically.

Balance sensor

Before starting the measurement, we need to balance the strain gage. Click "**Balance**", the output will go to 0 um/m, and the offset will be shown next to the button.

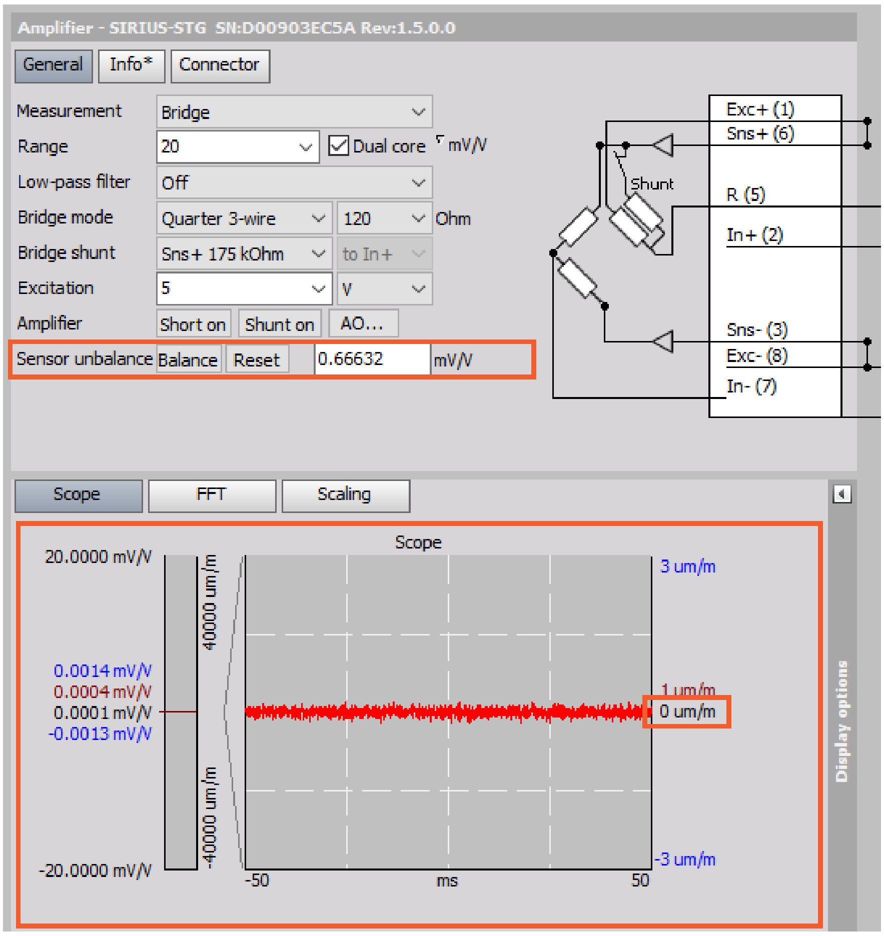


Image 15: Click on the Balance button to balance sensors before the measurement

Sampling rate

Because the natural frequency of the tuning fork is **440Hz**, we have to think of *which sample rate we want to digitize the signal*. In theory, a factor of 2 (=880Hz, Nyquist criteria) would be sufficient, in praxis however it depends very much how the signal looks like. We suggest a *factor of 10 or even 20* to get a good result.

So, the sample rate is still fine with 20 kHz.

Go again to "**Storing**", *specify a filename*, e.g. "tuning_fork_measurement". Then click "**Store**".

Scope Widget

Now we switch to the Custom... display and add the Scope widget to it. Maximize it over the whole screen.

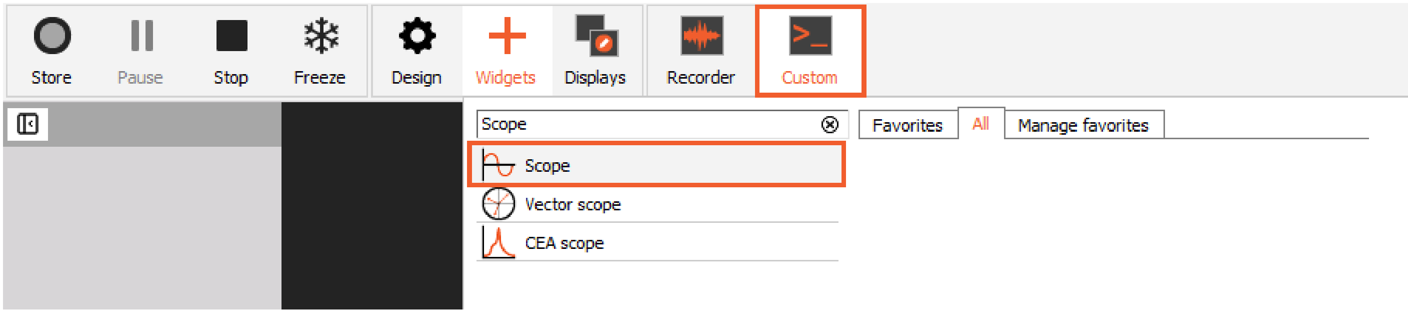


Image 16: Add a Scope widget

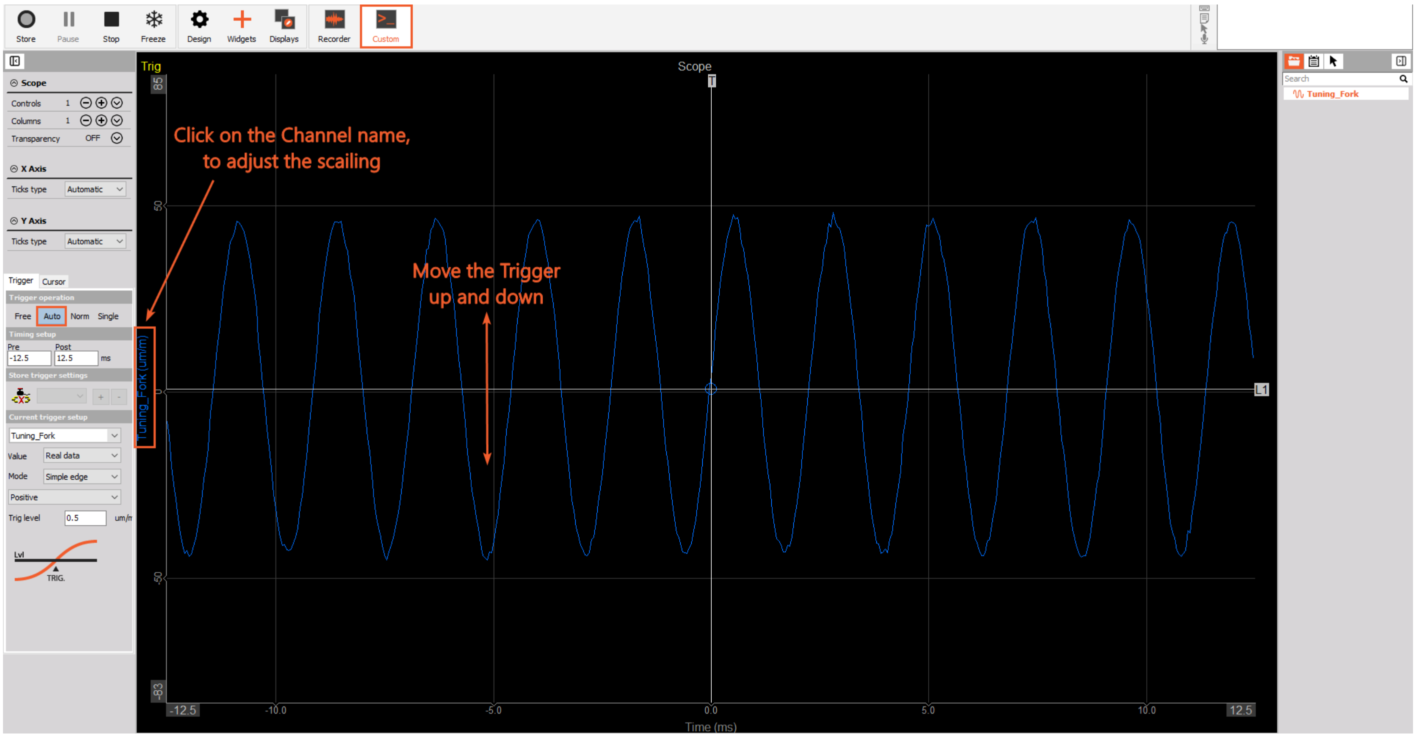


Image 17: Scope display can be randomly adjusted

Switch to the Scope screen. Hit the tuning fork, that we have an oscillating signal, then click the **y-axis label for min/max scaling**.

Set the **trigger** to *Auto*, in the properties of the left. Move the trigger level up- or downwards with the mouse, until you get a triggered image.

With the **+/- buttons** on the x-axis 

, you can adjust the time window shown.

Customizing Displays

Now we want to add an FFT instrument, to measure the resonance frequency of the tuning fork. Usually the Custom... screens are always empty so you fill them with any widgets, but basically no matter what display is, every display can be adapted to your needs.

Design mode

Go to the "**Design mode**", either by clicking the "*Design" tab* on the top or just starting adding the Widgets by clicking on *"Widgets" tab.*

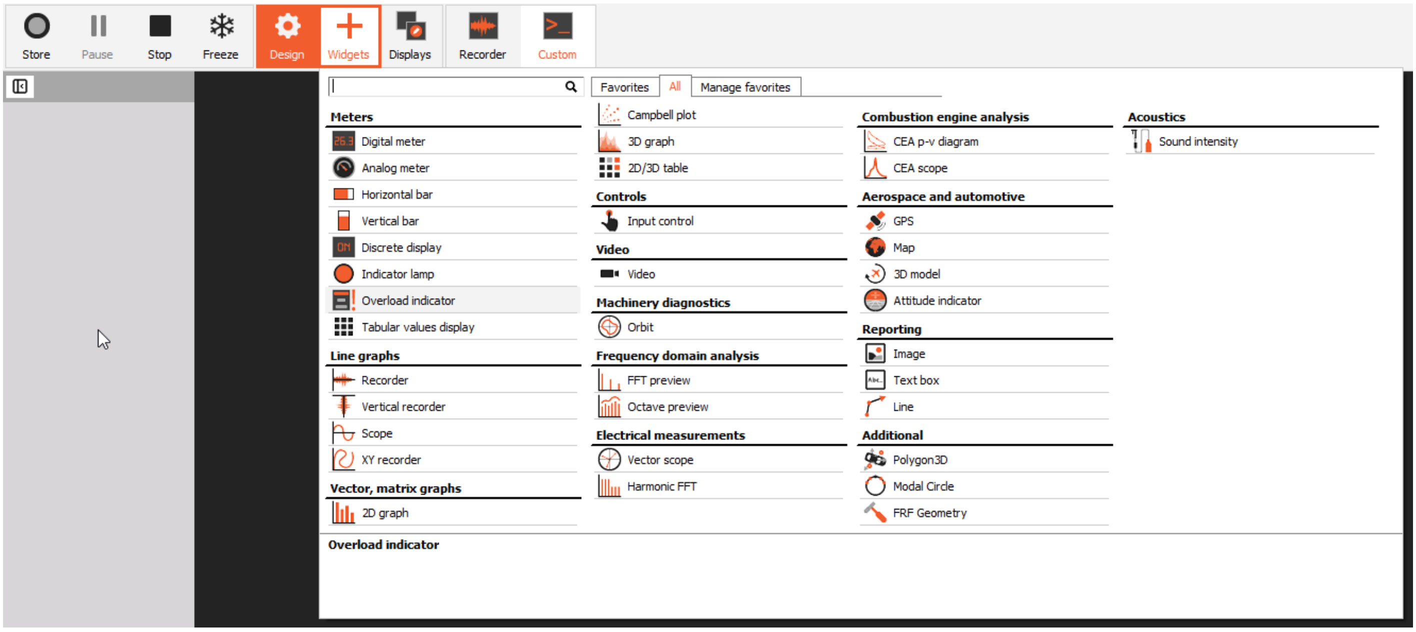


Image 18: Enable Design mode by clicking on a Design button or by adding widgets to the display

In the Widget search window type in FFT and add an FFT widget on a display.

Automatically the channel "AI 5" is assigned to the instrument as it is the only "Used" channel we had.

As you are in "Design mode" you can now freely adapt the size of the FFT and move it to your favorite location on the screen. After you fit the FFT diagram to your needs, exit the Design mode by clicking on a Design button.

FFT instrument

Following steps help to get your data displayed quickly with the FFT:

- **Y scale type** set on "*Log*".
- **Adjust Y-axis** according to the range you are measuring. In this case, it is set from 0.001 to 1000 um/m.
- **Click on the measured peak** when the tuning for is vibrating. The values of the peak will be displayed, showing the maximum of 439,5 Hz with the according to amplitude.

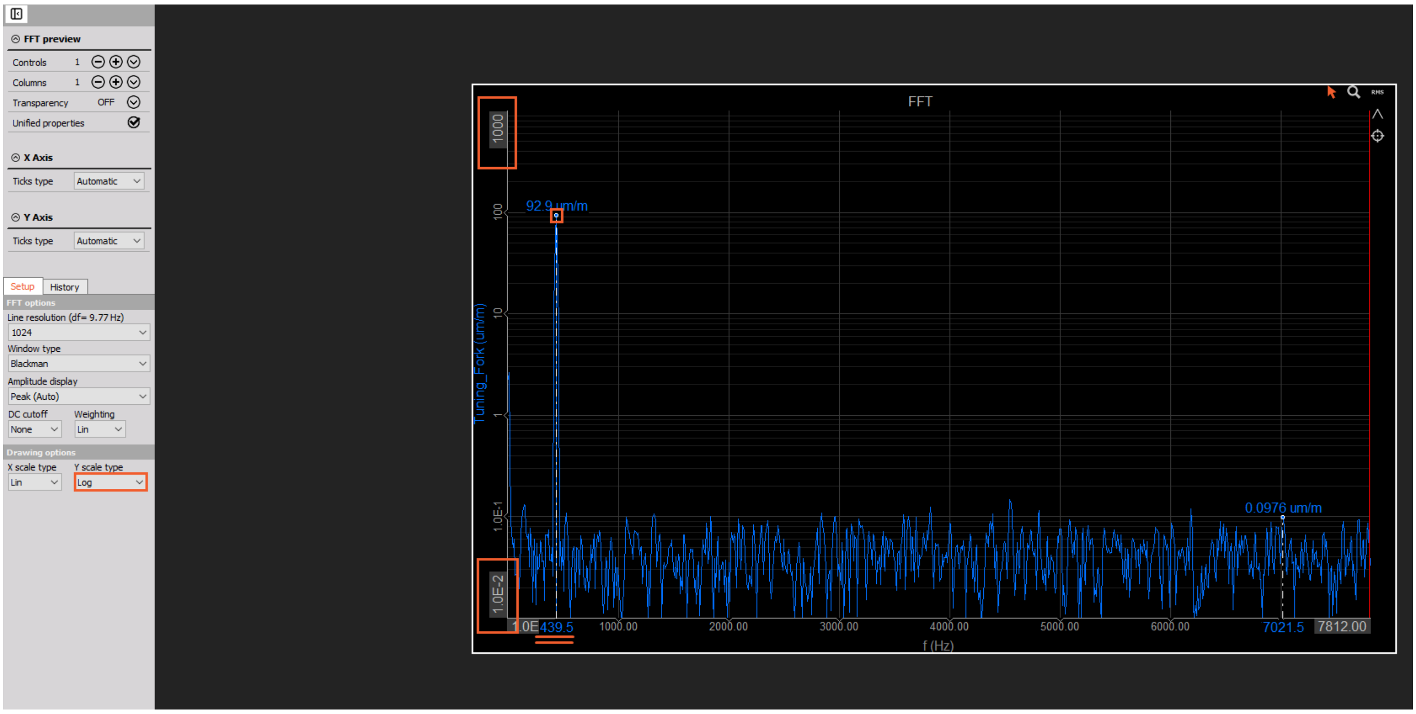


Image 19: FFT widget

Analysis folder View

After stopping the measurement, click on the **Analysis button**, and go to the Data files tab. You will see the Analysis folder view, which is like an Explorer. On the bottom, you get information about the channels and data header, and with the powerful search fields, you easily find the data file you are looking for.

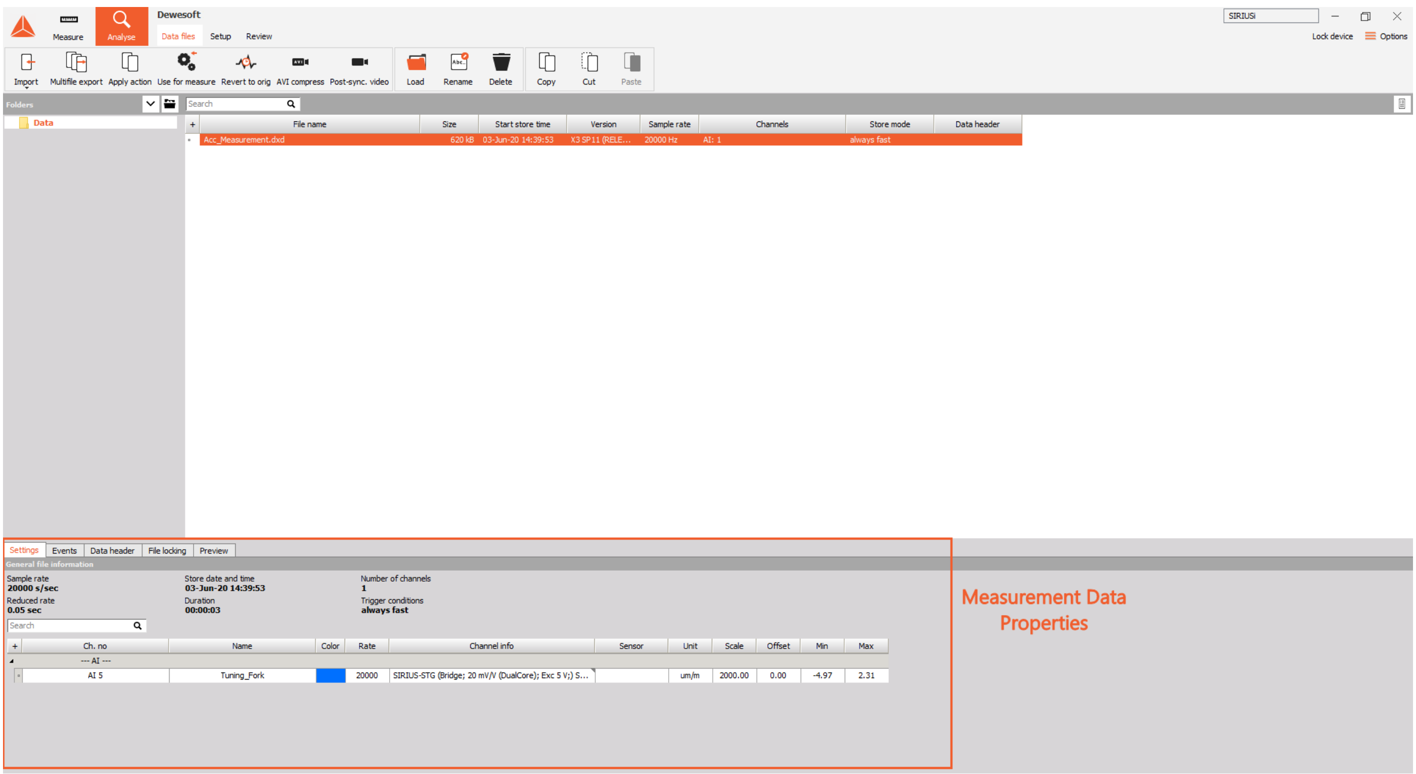


Image 20: Measurement data properties

To learn more about strain gages and how to measure strain and stress, visit our Strain measurement tutorial.

How to connect the Encoder?

Now we connect the demo encoder to e.g. *ACC+* or *STG+* (with additional Lemo connector), or *MULTI module*.

Image 21: Encoder coupled with the SIRIUS device

Per default the *Counter inputs are not visible* in [Dewesoft X](), we have to *add them with the* "**+ More**" button.

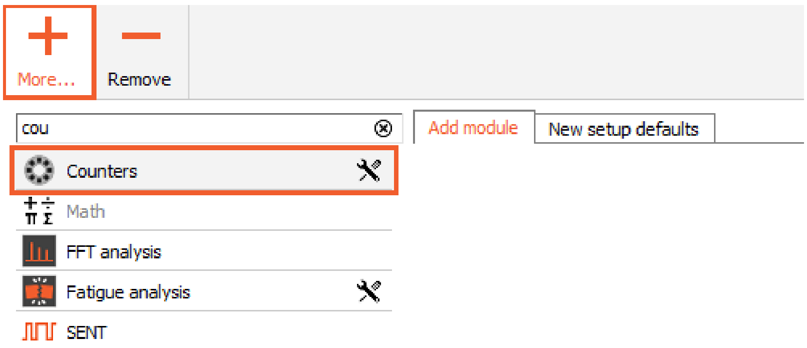


Image 22: Add Counters to the Dewesoft X software

Also, other software options can be added here, e.g. Power, Order tracking, Modal test... The Counters *will appear now as a ribbon on top*.

The buttons on top can be customized, click the "+" button again, go to "New setup defaults" and set the asterisk for the Counters. From now on *they will appear as default* each time when starting [Dewesoft X]().

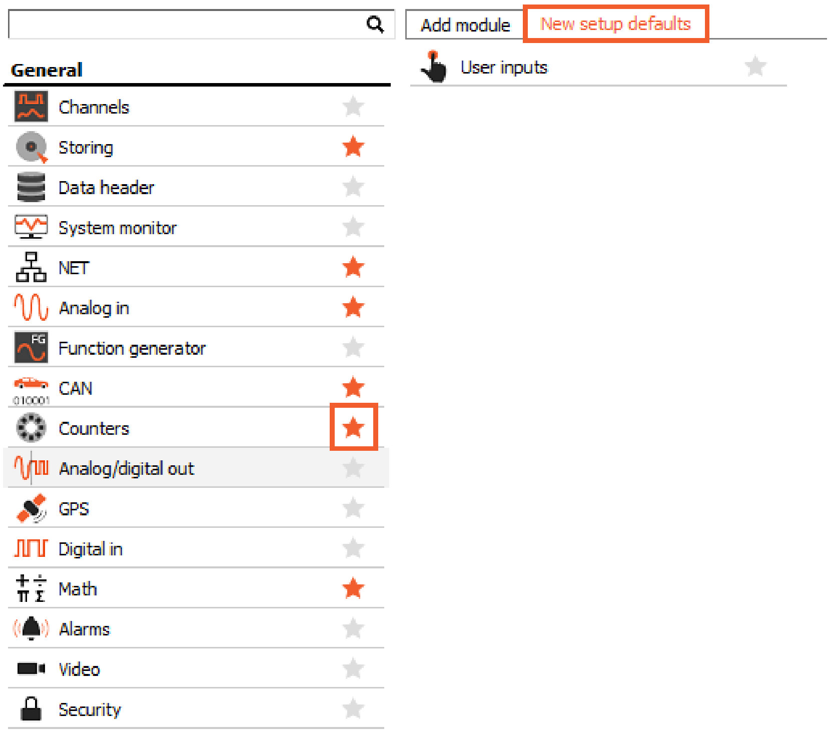


Image 23: Add Counters module as favorite

There are two typical counter techniques:

- the **gated measurement** (high-frequency range typical > 100 Hz), and
- **pulse width measurement** (low-frequency range typical < 100 Hz).

Many applications need both, the **counter information** and the **analog data**. Traditional systems do not offer the counter information synchronized to the A/D converters because *they get the counter information only either after the gate time* or *after the pulse time measured.* In comparison to standard counting with software interpolation (value 1.5 shown on image 24), **Dewesoft X real-time counting uses an additional counter on a 102 MHz time base to get the exact time of the rising edge of the signal.** This unique feature *allows the calculation of the exact counter value* at the A/D sample point (value 1.87 on the image 24).

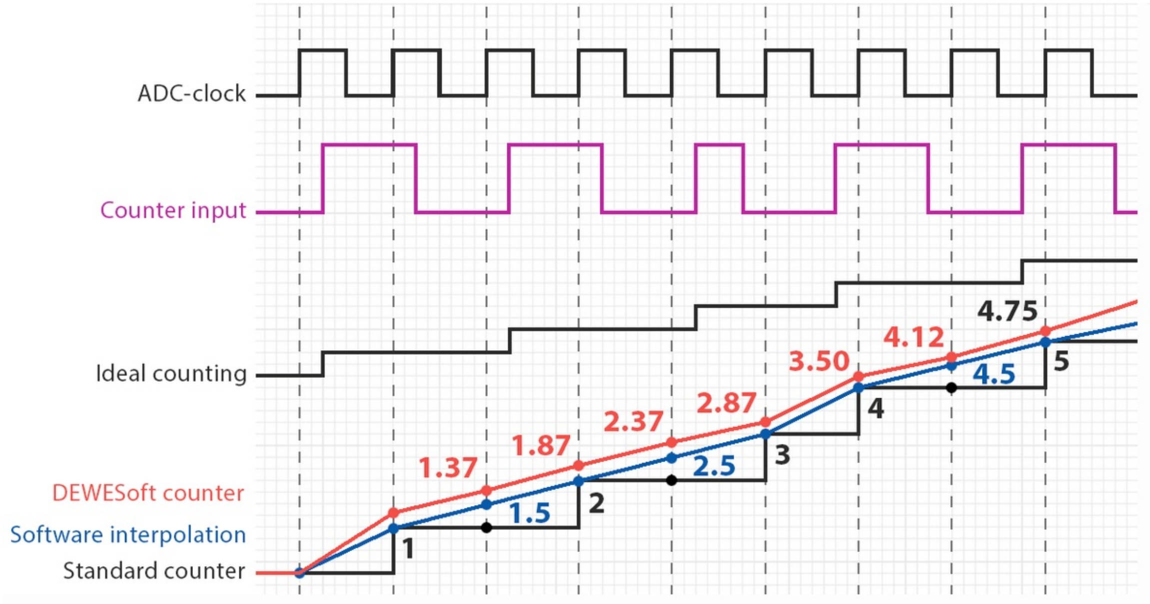


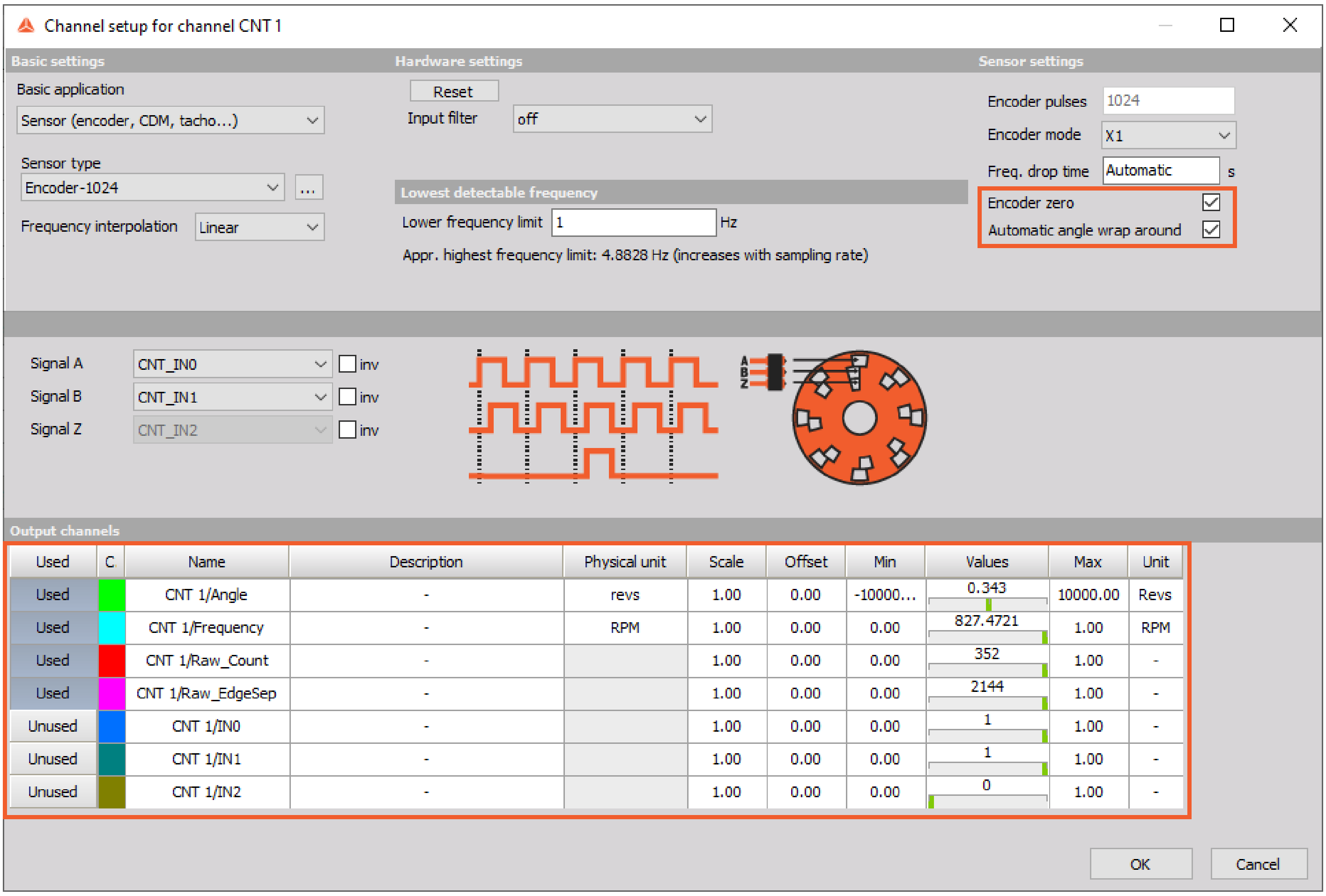
Image 24: Comparison of traditional counting and Dewesoft Counter, which bases on value interpolation

When you turn on the encoder, you should already see the Counter value increasing. Each counter (CNT x) consists of **3 digital inputs** (IN0, IN1, and IN2). Set the channels to **Used** and enter the **Setup**.

+	Used	C	Sample rate	Name	Description	Counter type	Min	Values	Max	Unit	Setup
◢				CNT 1	Event counting mode						Setup
	Used		20000	CNT 1	-	Events	0.00	169288	10000.00	Revs	...
	Used		20000	CNT 1/IN0	-	Digital	0.00	0	1.00	-	...
	Used		20000	CNT 1/IN1	-	Digital	0.00	1	1.00	-	...
	Used		20000	CNT 1/IN2	-	Digital	0.00	0	1.00	-	...
◢				CNT 2	Event counting mode						Setup
	Unused		20000	CNT 2	-	Events	0.00	0	10000.00	-	...
	Unused		20000	CNT 2/IN0	-	Digital	0.00	1	1.00	-	...
	Unused		20000	CNT 2/IN1	-	Digital	0.00	1	1.00	-	...
	Unused		20000	CNT 2/IN2	-	Digital	0.00	1	1.00	-	...

Image 25: Set the counter on Used and open Setup

Counter setup



Used	C	Name	Description	Physical unit	Scale	Offset	Min	Values	Max	Unit
Used		CNT 1/Angle	-	revs	1.00	0.00	-10000...	0.343	10000.00	Revs
Used		CNT 1/Frequency	-	RPM	1.00	0.00	0.00	827.4721	1.00	RPM
Used		CNT 1/Raw_Count	-		1.00	0.00	0.00	352	1.00	-
Used		CNT 1/Raw_EdgeSep	-		1.00	0.00	0.00	2144	1.00	-
Unused		CNT 1/IN0	-		1.00	0.00	0.00	1	1.00	-
Unused		CNT 1/IN1	-		1.00	0.00	0.00	1	1.00	-
Unused		CNT 1/IN2	-		1.00	0.00	0.00	0	1.00	-

Image 26: Counter setup

In our case, we have a *1024-pulses Encoder* with A, B, and Z track. Set the basic application to **Sensor (encoder...** and the sensor type to "**Encoder-1024**". Enable the "**Encoder zero**", so the angle will be reset with the Z pulse once per revolution, also enable the **Automatic angle wrap around**.

The most important output channels below are **Angle, Frequency,** and **Raw_Count.**

Go to the *Design mode* and add *Analog meter, Digital meter, and Recorders*. Set the properties on the left for each instrument (min, max values, and resolution).To *assign/unassign a channel* to an instrument, click on the instrument first, then select/deselect the channel from the channel list on the right.

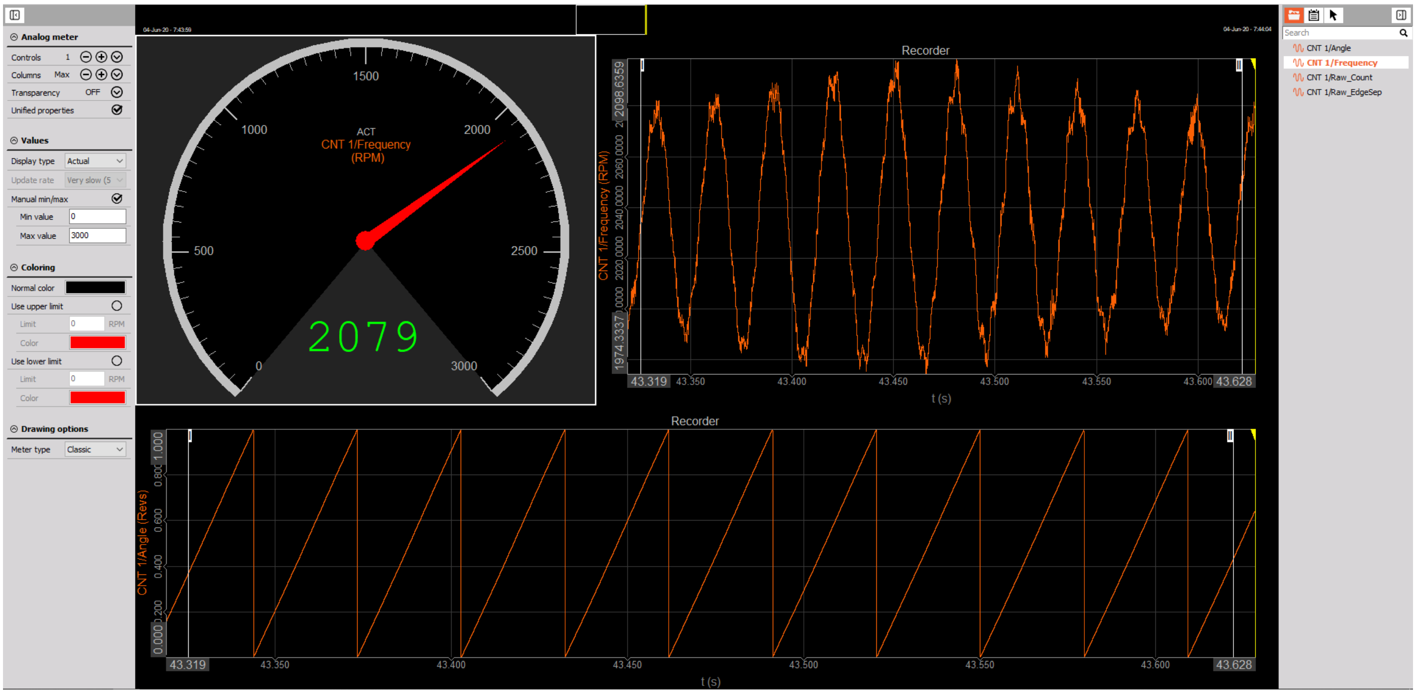


Image 27: Assign channels

Analog and Digital meter

Below you see some example properties for the analog and digital meter. This should help you for displaying your RPM signal.

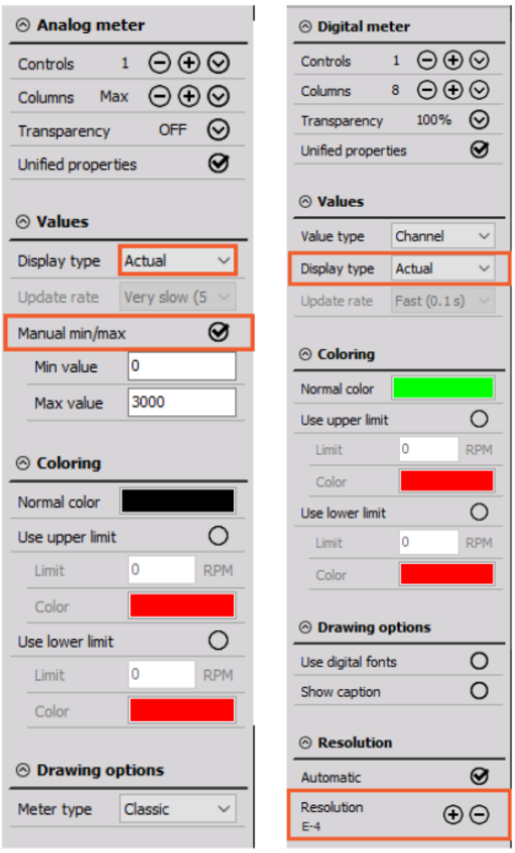


Image 28: Properties for Analog and Digital meter

Save the Setup

After you have done all the sensor settings and created your own screen, you can *save this setup/display configuration to a setup file (*.dxs)*. Therefore *stop the measurement*, or *go back to Channel setup*, then click the Dewesoft X icon button, and use "**Save setup as...**".

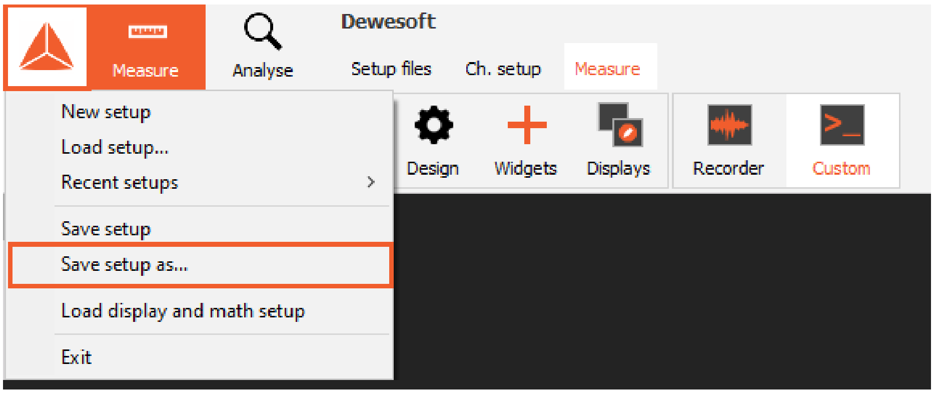


Image 30: Save the setup

The same way you can load any configurations.

To learn more about counters and angle sensors, visit our Digital counters training.

What for is the Math module used?

In Dewesoft X, we have extended Math library and several software modules for special applications. Let's only look to one of them as an example, you will find more. We will use the *Power module to calculate active power* and *we will measure grid frequency*. First, we must add the **Power analysis module** - under '**+ More**' button.

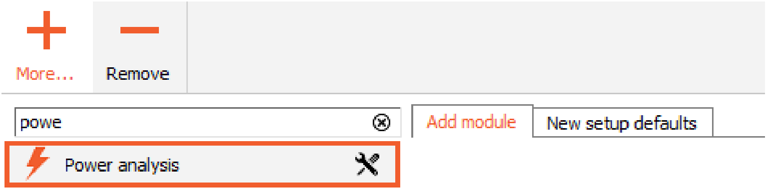


Image 31: Add Power analysis

We have several settings and calculation options, but for basic measurement, we only need to assign the right channels. For **U1**, we select the *voltage channel* and for **I1** we select the *current channel*.

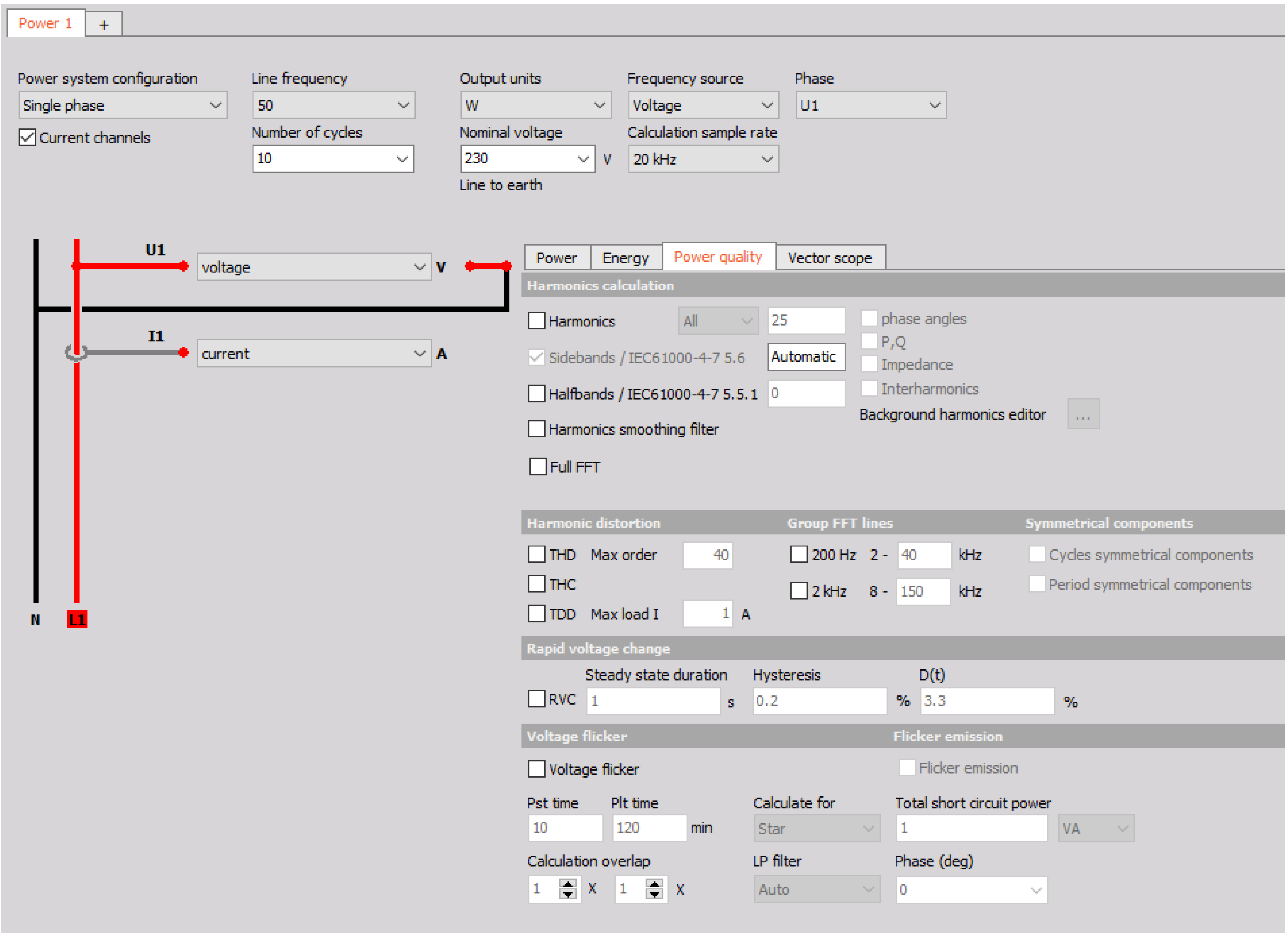


Image 32: Select the proper channels to the voltage and current

Go to measure screen, and you will have several predefined displays related to the power module displayed. You can also, of course, create your own display as a combination of power and other parameters.

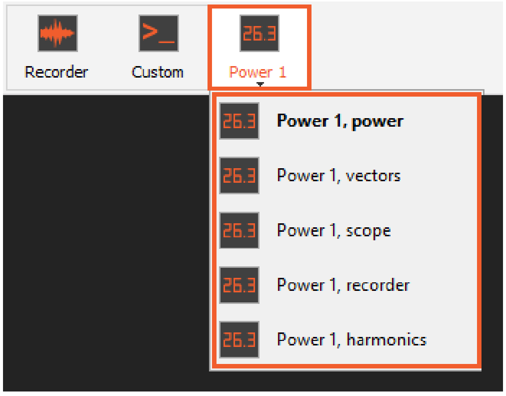


Image 33: Predefined Power displays

After setting the input and math channels, we are prepared to perform a measurement. Let's store some data by pressing the **Store button**. Once the data is stored, we can press **Stop** to stop the recording.

By pressing **Analyse**, the file can be review for analysis. We can look on different screens and by pressing *Play*, we can replay the data.

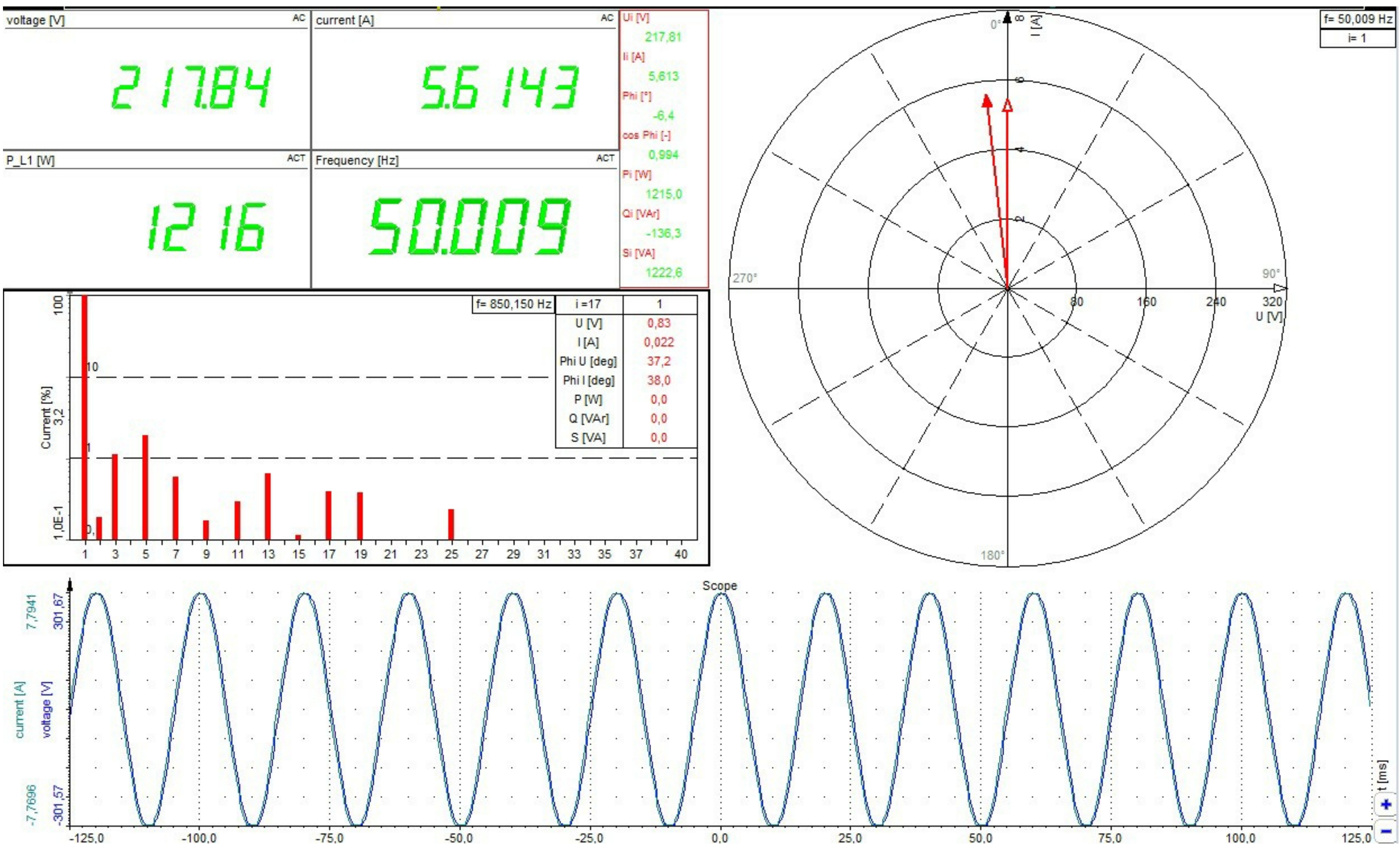


Image 34: Widgets for Power analysis

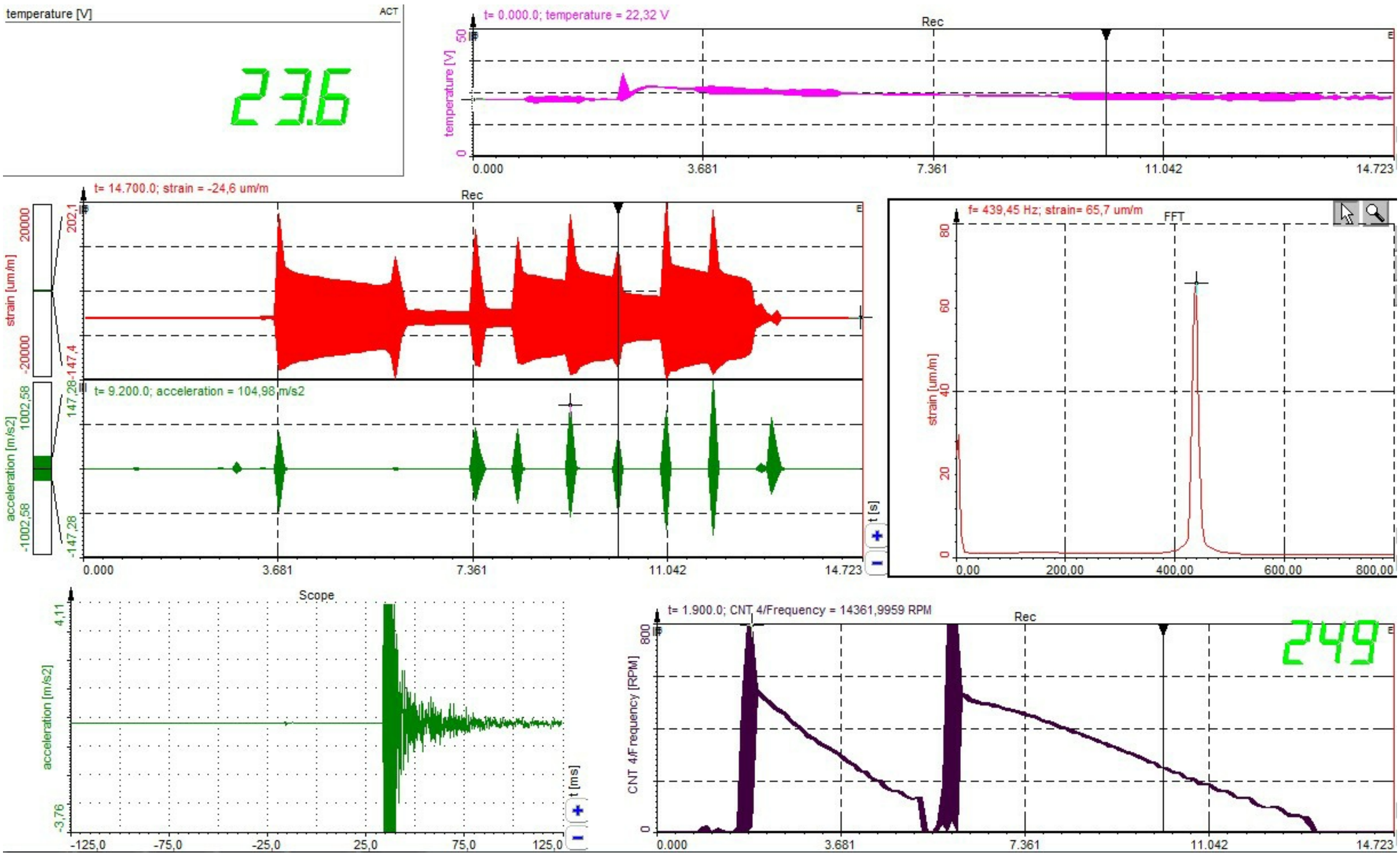


Image 35: Analysis of power measurement data

For the analysis of data, [Dewesoft X](#) offers several possibilities. We can do *Offline math* inside the software, we can *export data* to other software packages or we can simply *print the display* which we would like to add to the report. Of course, all file operations like merging the files together, renaming, and deleting them are possible.

By selecting the **print button**, the selected display will be printed out.

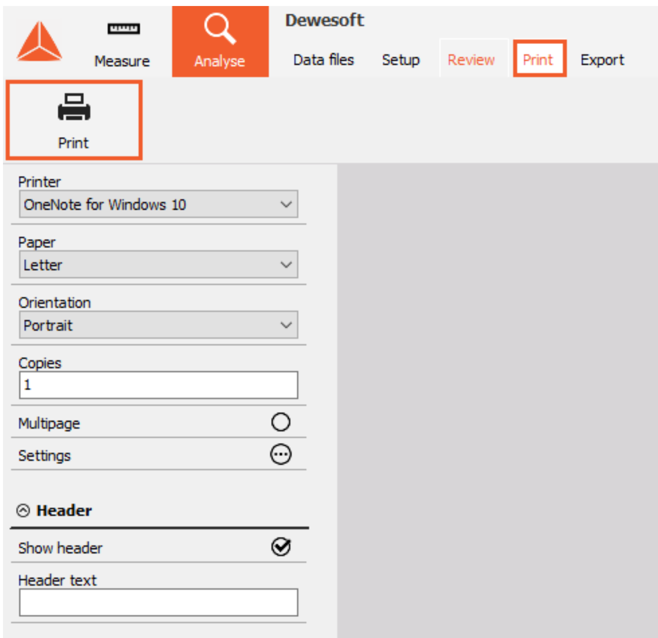


Image 36: Print the report

We can also **export data in various formats** (Excel, Matlab, Diadem, Flexpro, ...) by selecting **Export function.**

How to apply an Offline Math?

If we want to perform additional analysis on data already stored, it is very easy to do Offline math inside Dewesoft X. Here *we will calculate vibration velocity out of an acceleration signal*. To do that we must select the **Offline math** button:

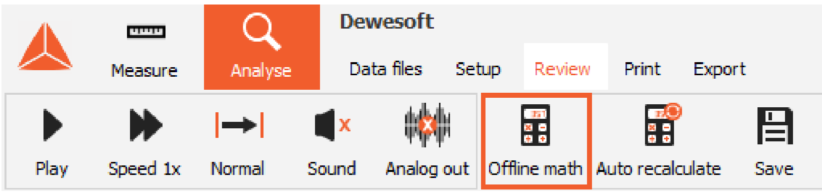


Image 37: Open Offline math in Analyse mode

Choose '**+ Add math**' button and select a **Time integration, derivation** for our case.

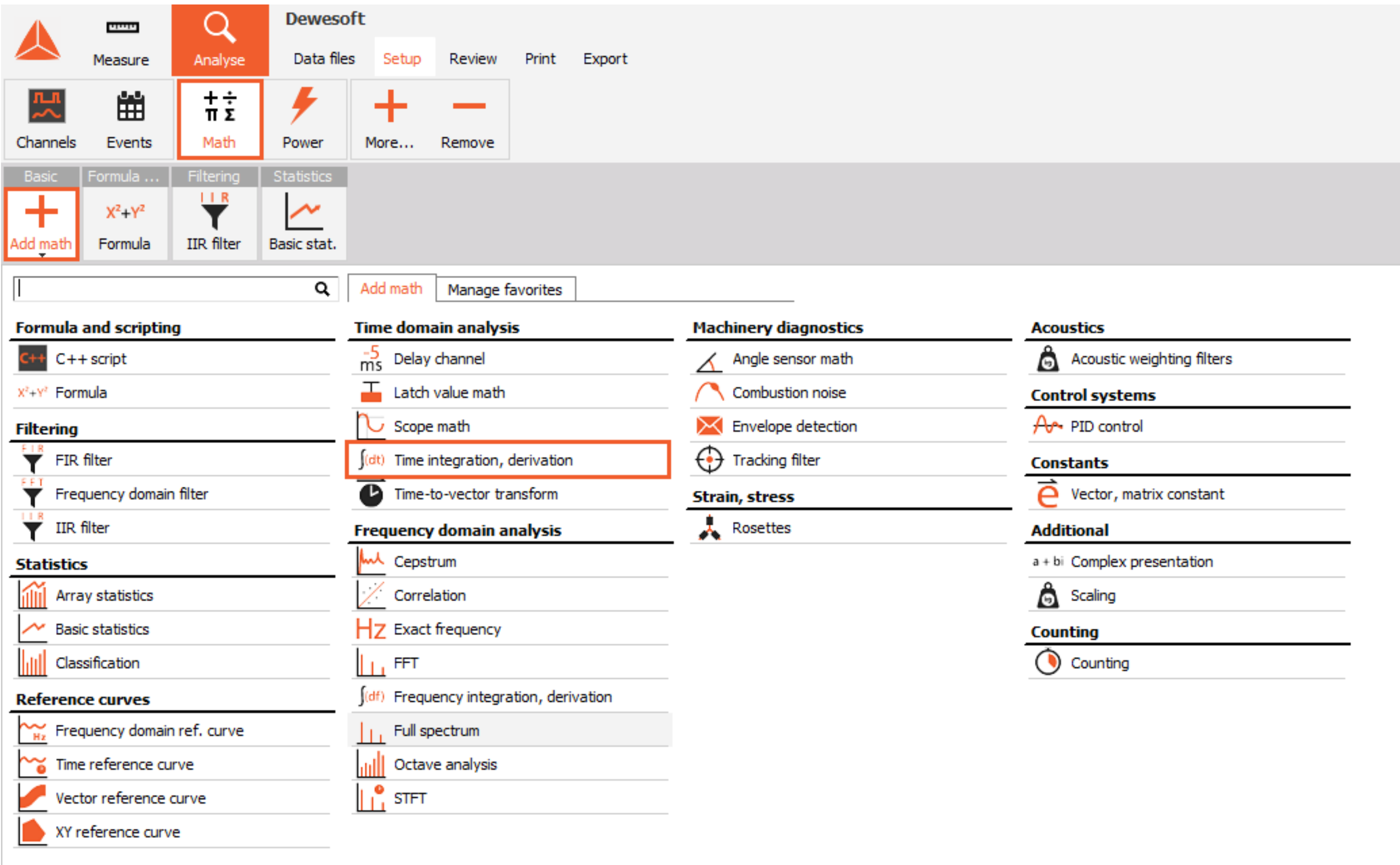


Image 38: Add Time integration, derivation math in offline mode

In the setup, we select the *acceleration channel,* on which we will perform integration. Please note that the *system will already suggest the units of measurement to be mm/s and do automatic conversion*. We can, of course, select an alternative unit, like 'ips'.

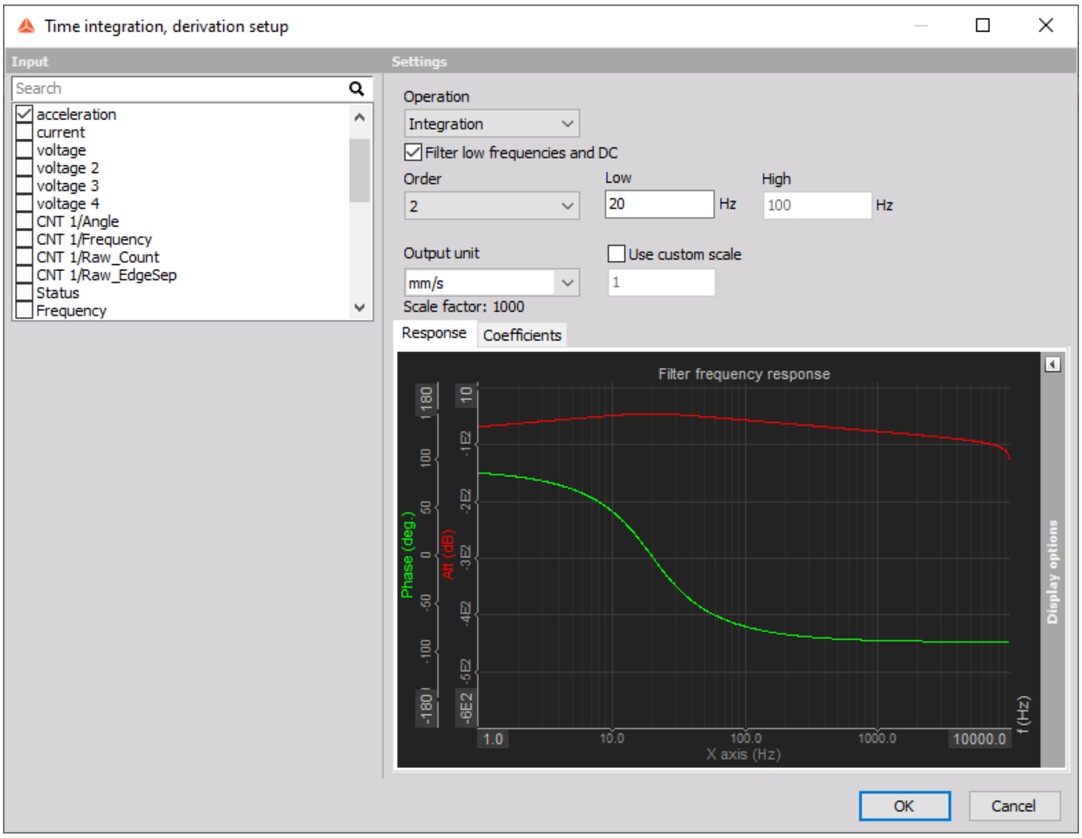


Image 39: Time integration of acceleration channel

After we have done this, we **go back to Review**, *add one Recorder display* on which we will put *acceleration signal* and created *math signal vibration velocity*. To calculate this math signal, we must click on the **Recalculate button**. Now we can see both signals.

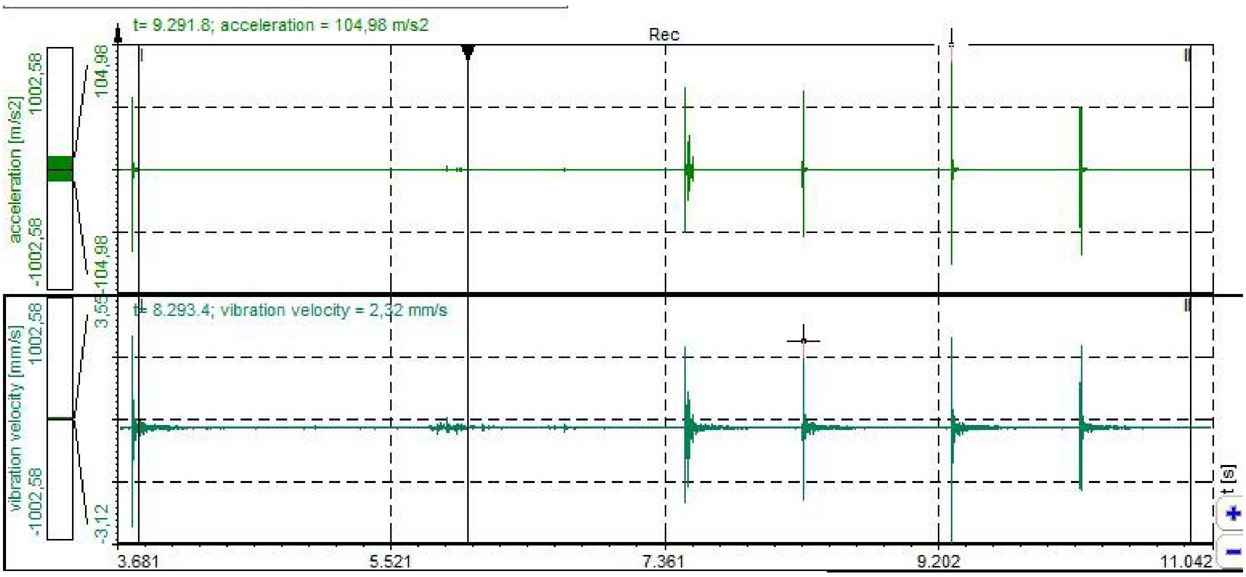


Image 40: Preview the acceleration and vibration velocities signals

There are many things to do in Dewesoft X and we invite you to visit further sessions on different topics *How to measure signals, How to analyze the data,* and *How to use* Dewesoft X.

Sine Wave on All Channels

In case you have set the Operation mode in Dewesoft X to "**Offline**" mode, you will get a picture like below - **sine waves with random amplitude and frequency on all channels.**

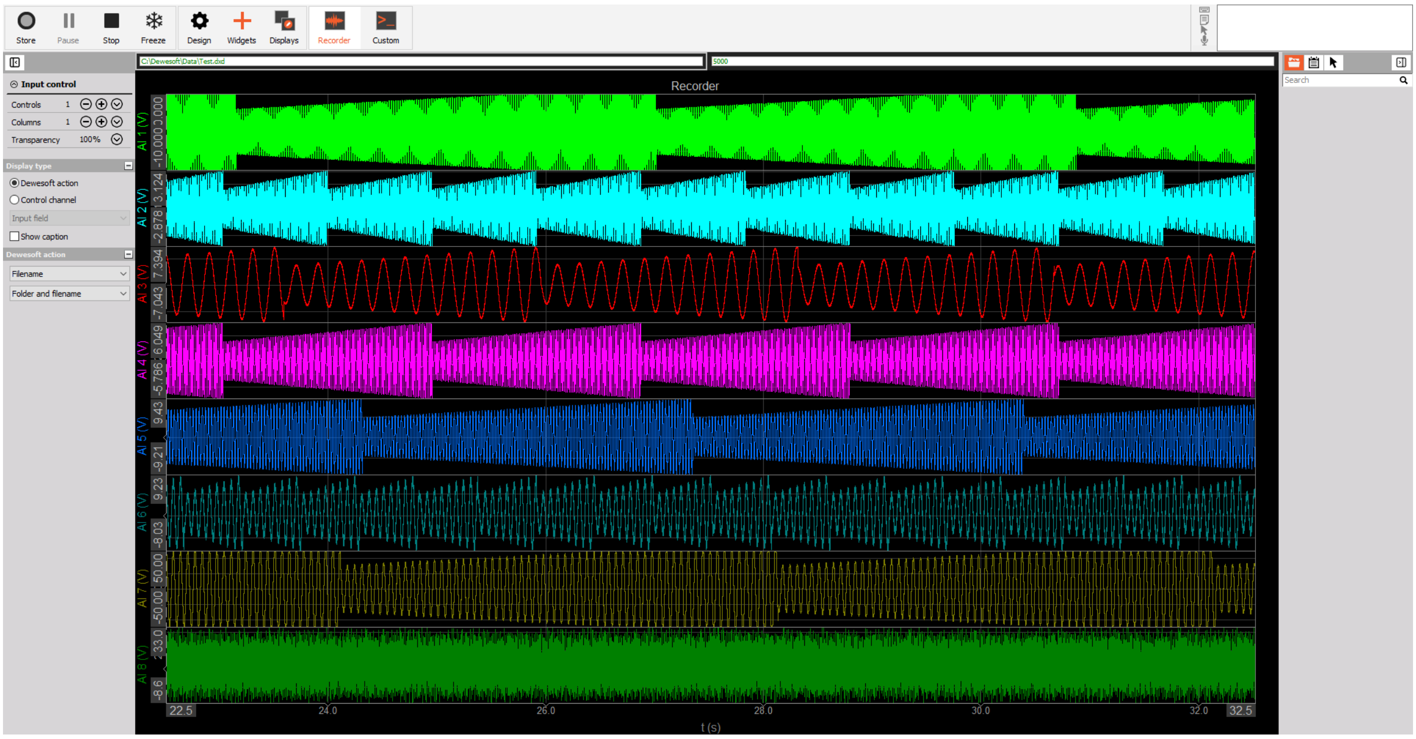
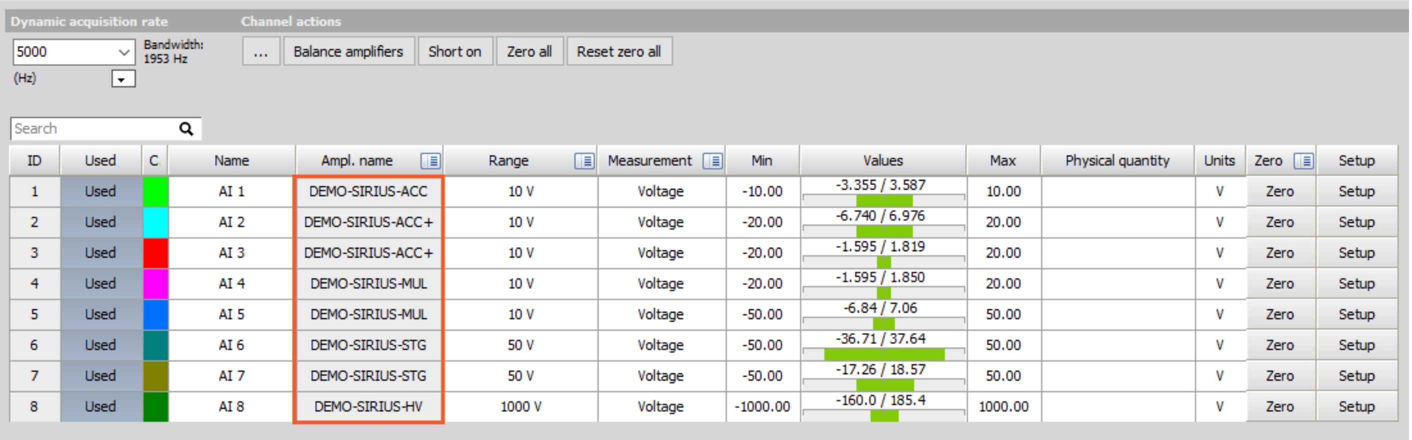


Image 41: Sine waves with random amplitude and frequency on all channels as an output of Offline mode

When you switch back to Ch. Setup, the amplifiers will show "**Demo-...**". In this case, please review the upper page - Manual setup of hardware.



ID	Used	C	Name	Ampl. name	Range	Measurement	Min	Values	Max	Physical quantity	Units	Zero	Setup
1	Used		AI 1	DEMO-SIRIUS-ACC	10 V	Voltage	-10.00	-3.355 / 3.587	10.00		V	Zero	Setup
2	Used		AI 2	DEMO-SIRIUS-ACC+	10 V	Voltage	-20.00	-6.740 / 6.976	20.00		V	Zero	Setup
3	Used		AI 3	DEMO-SIRIUS-ACC+	10 V	Voltage	-20.00	-1.595 / 1.819	20.00		V	Zero	Setup
4	Used		AI 4	DEMO-SIRIUS-MUL	10 V	Voltage	-20.00	-1.595 / 1.850	20.00		V	Zero	Setup
5	Used		AI 5	DEMO-SIRIUS-MUL	10 V	Voltage	-50.00	-6.84 / 7.06	50.00		V	Zero	Setup
6	Used		AI 6	DEMO-SIRIUS-STG	50 V	Voltage	-50.00	-36.71 / 37.64	50.00		V	Zero	Setup
7	Used		AI 7	DEMO-SIRIUS-STG	50 V	Voltage	-50.00	-17.26 / 18.57	50.00		V	Zero	Setup
8	Used		AI 8	DEMO-SIRIUS-HV	1000 V	Voltage	-1000.00	-160.0 / 185.4	1000.00		V	Zero	Setup

Image 42: Demo- prefix is defined only for simulated channels