Dewesoft Application note:

Analog Out configurations

Configurations:

1. **Standalone amplifier**
2. **File replay**
3. **Control channel**
4. **Function generator**
5. **Math output**

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Requirements:

1. DEWESoft SIRIUS device with Analog Out
   a. AO8 option (8 outputs)
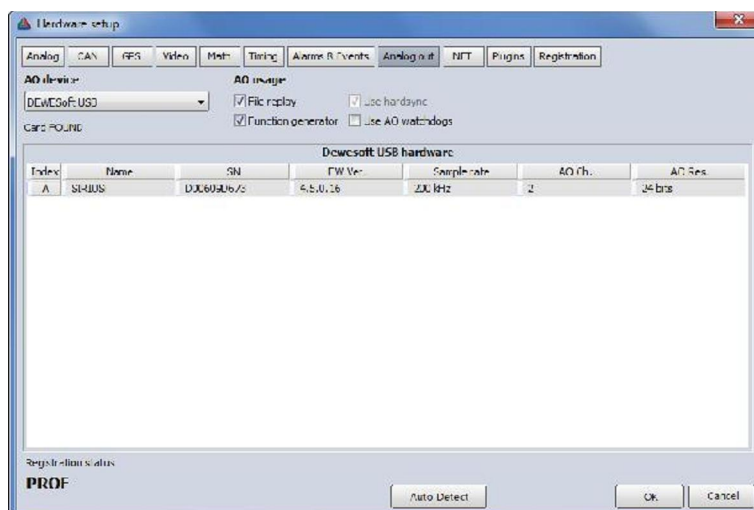   With this option the SIRIUS device is manufactured with 8 BNC plugs on the rear side.

   b. or at least 1 MULTI module (1 output per amplifier)
   The MULTI amplifier consists of 1 Analog in, 1 Counter in and 1 Analog out.

2. Next you have to enable the Analog Output in Settings -> Hardware setup -> Analog out.
   Select "DEWESoft USB" interface.

1. Standalone amplifier

For some applications the DEWESoft instrument is used as a pure signal conditioner. No DEWESoft software is needed, no USB cable connected. The SIRIUS just converts the input signal of e.g. +/-1000 um/m to an output voltage of +/- 10V.

All the amplifier settings are permanently stored in the SIRIUS instrument. You only need a power supply.

AO8   +/- 10 V

+/- 1000 um/m
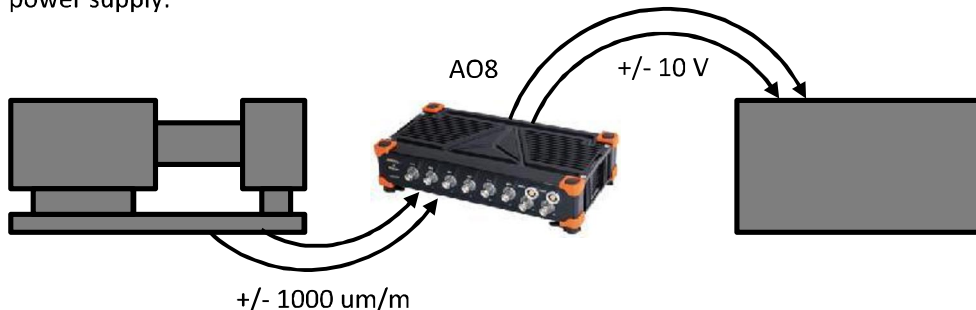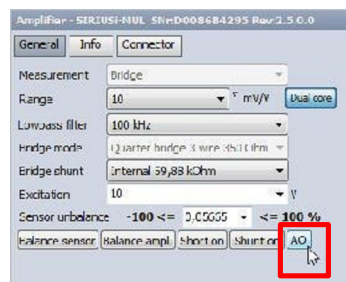
Engine test bed   SIRIUS standalone   Measurement system

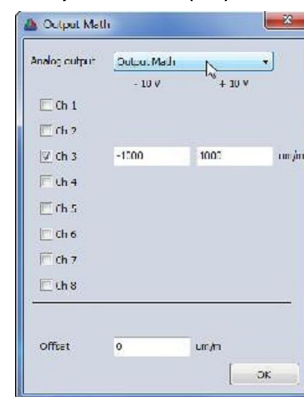**Caution: The "Standalone mode" is ONLY available with the AO8 option!**

Connect the tuning fork (scaling in strain um/m) and enter the channel setup.

When you hit the fork, the input signal is about +/- 500 um/m peak, then it stays around +/- 150 um/m. Change the Min/Max channel limits to +/- 1000 um/m, this should be fine.

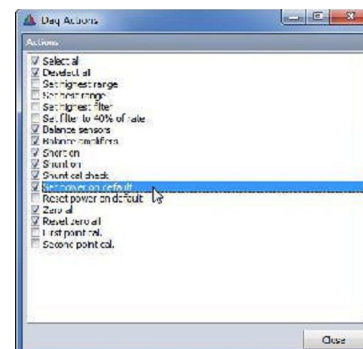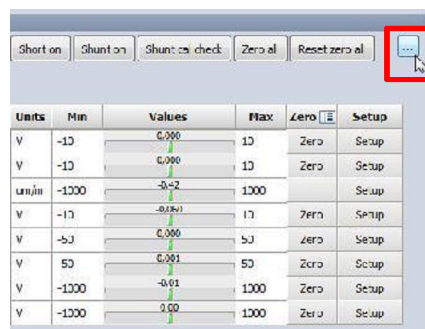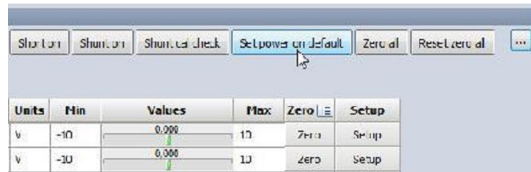Click on the button "AO".   Set Analog output to "Output math".

As you see, the channel limits (+/- 1000 um/m) are scaled to +/- 10 V.

Click on the "…" icon and add the "Set power on default" button.

Now click the button to permanently store the amplifier settings to the device.

Close DEWESoft and disconnect the PWR and USB cable. Then plug in only the PWR cable.

Hit the tuning fork. The peak value is about +/-5 V (equals +/- 500 um/m), then it drops to around +/- 1 V (+/- 100 um/m).
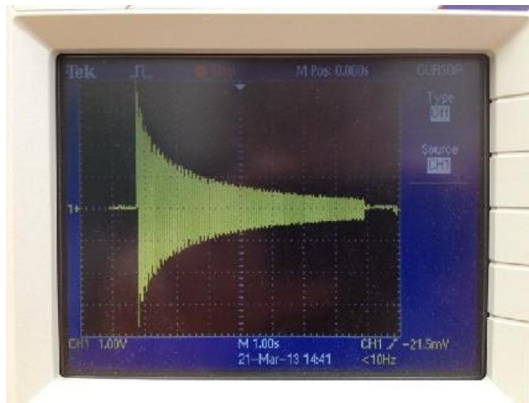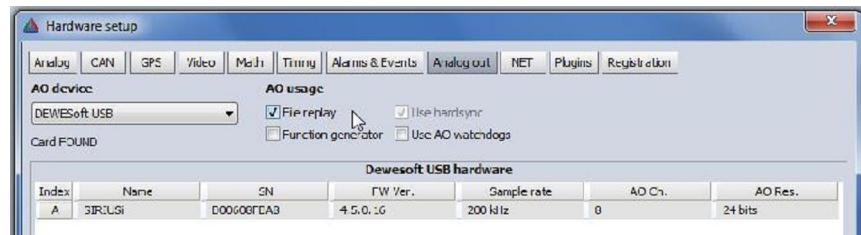

Foto of the test setup with oscilloscope connected on rear side AO (USB not connected).

2. File replay

At first check if the "File replay" option is enabled in Hardware setup.


a. With MULTI module AO

The MULTI module consists of Analog input, CNT input and Analog output.

In this example we will do a measurement with the tuning fork on channel 5 (STG module) and replay the measured file to the Analog output of the MULTI module on channel 3. The output signal is measured by an oscilloscope.
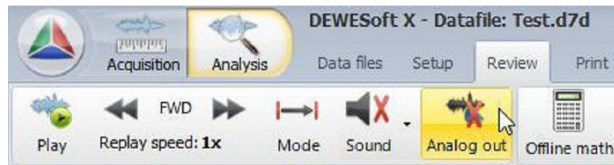

We use a strain gage with strain scaling (um/m). Do one hit, store a datafile:
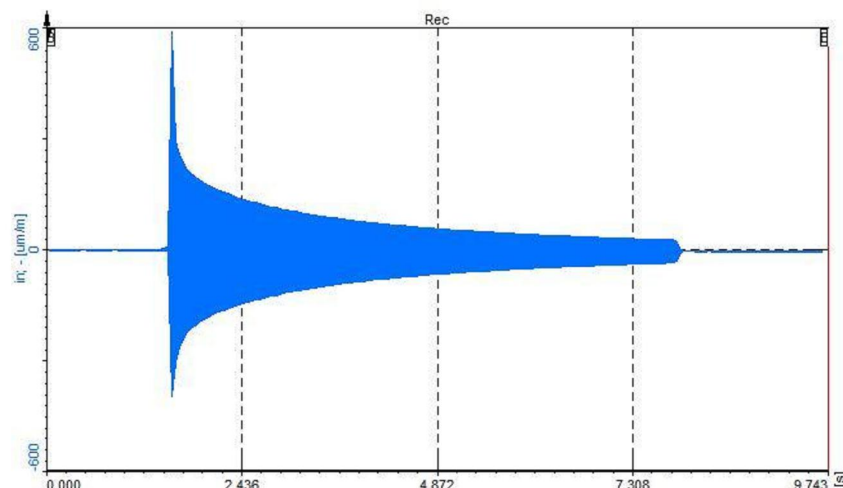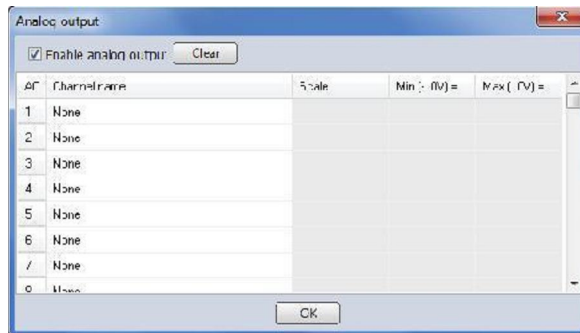

In this example the max amplitude is approx. 600 um/m.

Open the datafile and click on the Analog out button.

A popup appears where you can see an 8 AO's, one for each amplifier. In our case not every amplifier has an analog output. You have to take care about this yourself.

If you look on our Demo SIRIUS slice, there are 2 MULTI modules, which means we have 2 AO (channel 3 + 4).

Let's select for AO3 to put out the measured tuning fork signal (channel "in").
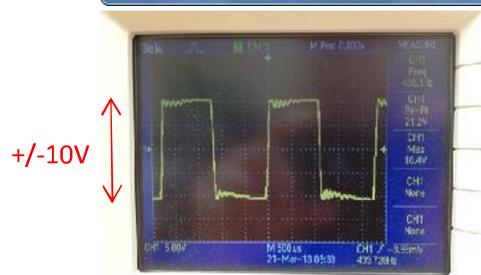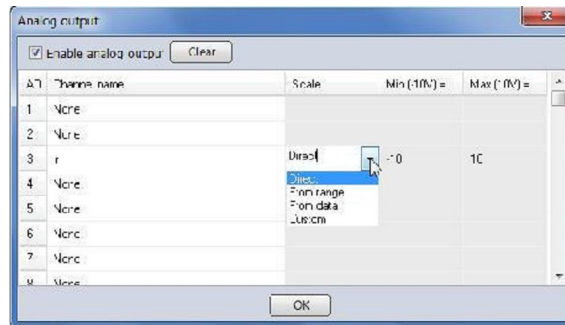
There are four different scaling options:
> Direct
> From range
> From data
> Custom

Let's have a look in detail.

Direct

Scale = 1; Offset = 0; This makes sense if you have an input amplifier with 10V input range and want to put out the signal 1:1. In our case the signal reaches much higher amplitude (+/- 600 um/m), so all parts above +/-10 um/m (+/-10V) will be clipped.
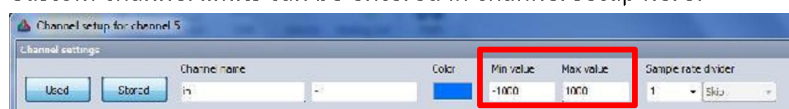

+/-10V

From range

This takes the channel limits, which were adjusted before the measurement (in our case +/- 20000 um/m = +/- 10 V).
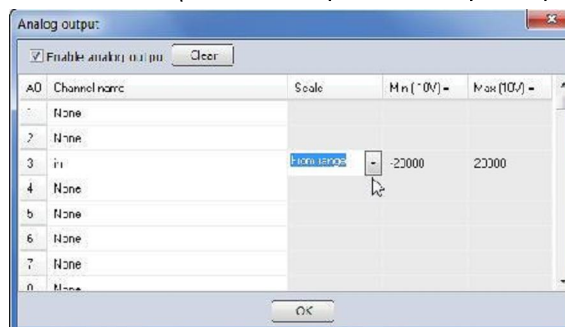
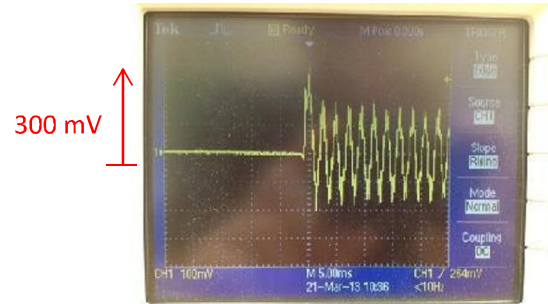
There is no possibility to change this afterwards. If different "custom" limits would have been entered before the measurement (e.g. +/- 1000 um/m) they would be shown here.

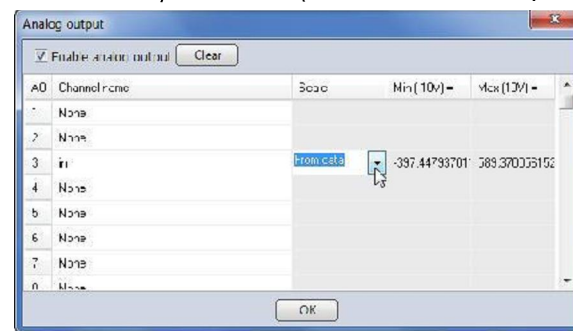Custom channel limits can be entered in channel setup here:

If 20000 um/m equals 10 V, 600 um/m equals 300 mV.
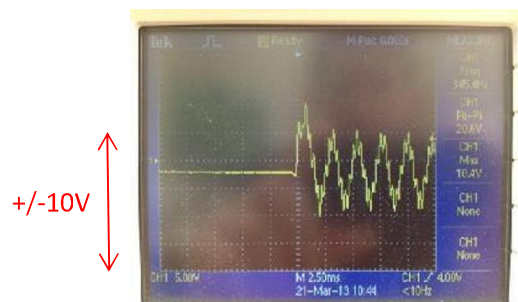
Let's zoom in with the oscilloscope, the max peak is 300mV, OK.

From data

If you select from data, the min / max peak values of the signal are automatically overtaken (in our case -397 um/m and 589 um/m).
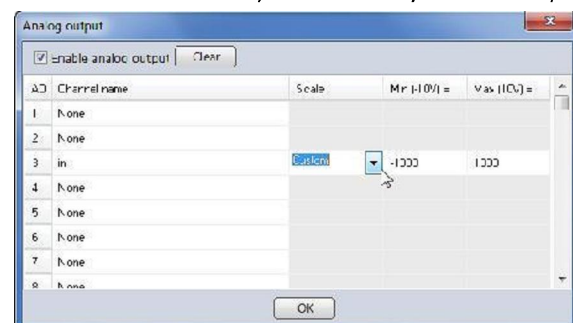

Of course the disadvantage is, that the signal is not symmetrical any more.

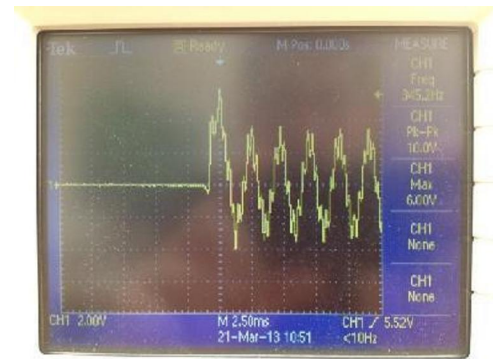**Custom**

Usually this setting is the most useful one.

For easier calculation, enter -1000 / +1000 um/m.

As our signal reaches 600 um/m peak, the expected output signal should be 6 V now. The oscilloscope proves that.


b. **With AO8 option**

The setup is very similar to the MULTI module, the only difference is that you can now use all 8 analog outputs on the rear side (8 BNC plugs), and you can route any signal to any output. You can also output the same signal on multiple outputs at the same time.

3. Control channel

You can use the Analog output also to manually output a value (changeable live during measurement, e.g. with a slider instrument)
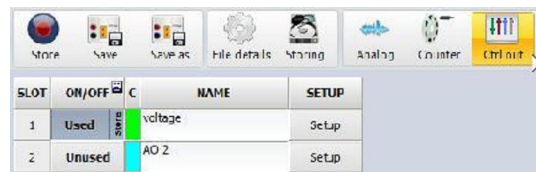
Let's show this function on a LED:
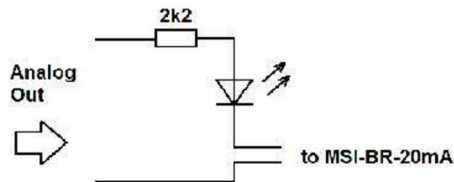
In this simple circuit the AO is connected to a LED over a resistor with 2k2 ohms (to limit the current), to the MSI-BR-20mA for current measurement.
The current is a standard analog input:

The Analog out is configured in the "Ctrl out" section. Enable the corresponding channel.

Add a control instrument in Measure mode. Set it to "horizontal slider".

Now when you move the slider to negative voltage, no current flows:

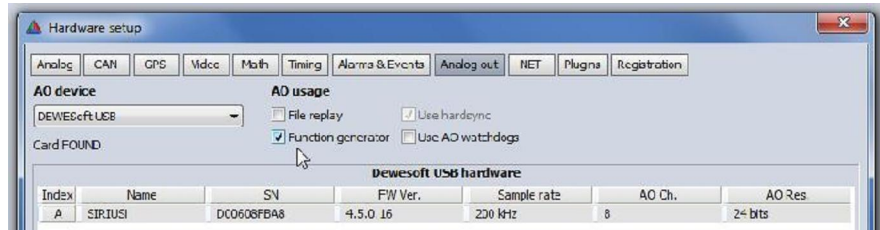If you move it to the right side, at first there is also no reaction:

But after a certain voltage (the forward voltage) is reached, a current flows and the diode starts lighting:

4. Function generator

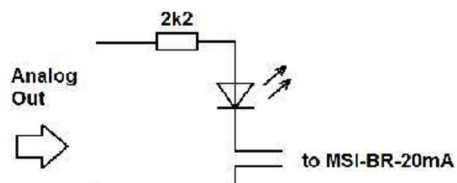The checkbox in hardware setup must be activated as shown below.
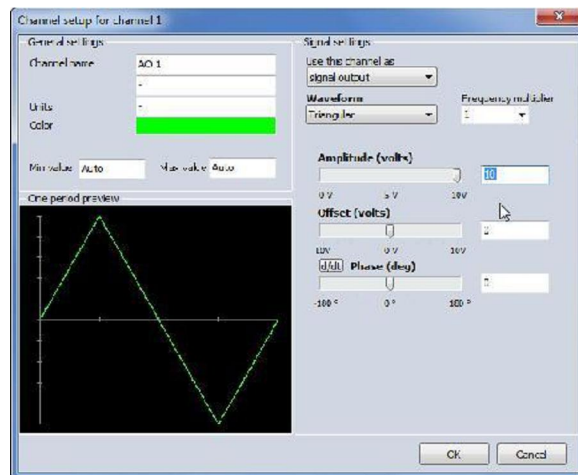

A new icon "Analog out" appears.

In case of having single MULTI modules instead of AO8 option the not usable outputs are marked with a red cross.
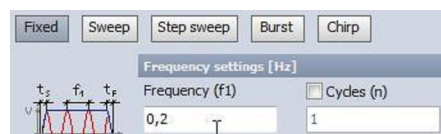

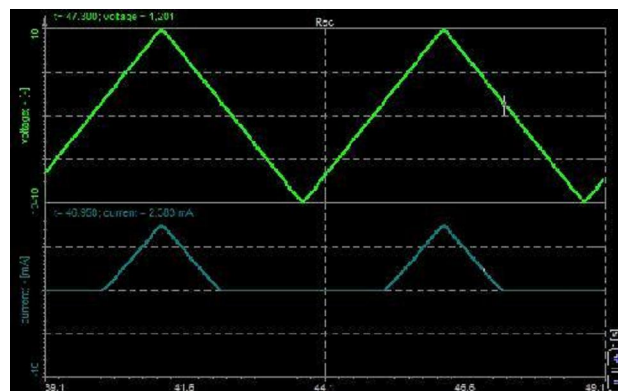Let's continue the example with the LED (see section 3):

Enable the Analog channel you want to use and select a triangular waveform with an amplitude of 10V peak (signal will go +/- 10 V):
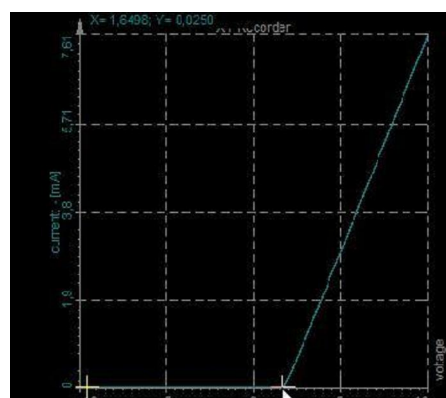

Select a very low frequency for output, e.g. 0,2 Hz.

As you can see, only when the voltage is positive, a current flows through the diode.

Use a XY recorder, assign "voltage" to the x- and "current" to the y- axis to get the characteristic line of the diode and measure the forward voltage, in this case about 1,65 V.

5. Math output

Let's show the basic principle on a **Frequency-to-Voltage-converter**.

The Encoder on the left side is mounted on a grinder bench. It is connected to the ACC+ counter input on channel 1. On the MULTI module on channel 4 a special split-adapter is connected, the analog output is routed to the oscilloscope.

 We configure the counter to get a Frequency channel (0...3000 rpm)

 Then we scale the frequency signal to a voltage (freq/3000*5 -> 0...5V)
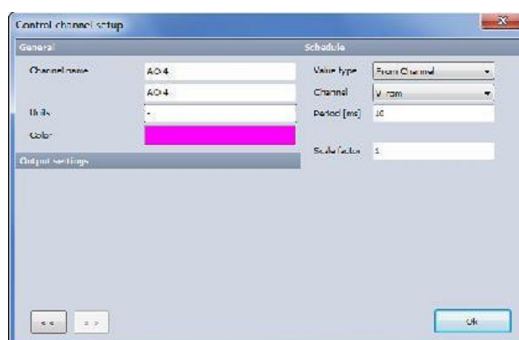
 Which we then put out via the "Ctrl out" section

Go to the "Ctrl out" and activate the output channel.

SLOT	ON/Off	C	NAME	SETUP
1	Unused		DO 1	Setup
2	Unused		DO 2	Setup
3	Unused		AO 3	Setup
4	Used		AO 4	Setup

Then chose to take the value from the Math channel, here called "V_rpm". Output period is for example 10 ms.
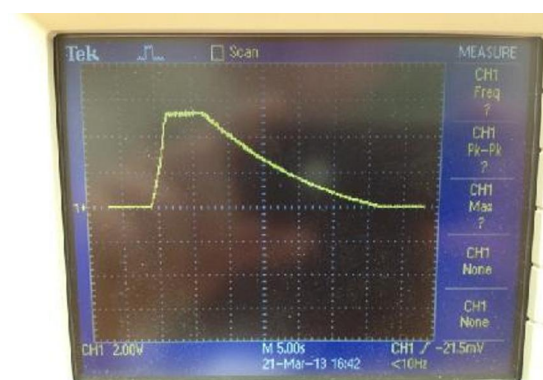
We start the engine and turn it off again. The coastdown takes about 30 seconds.

Below you see the three signals: the CNT input, the scaled math channel and the AO.
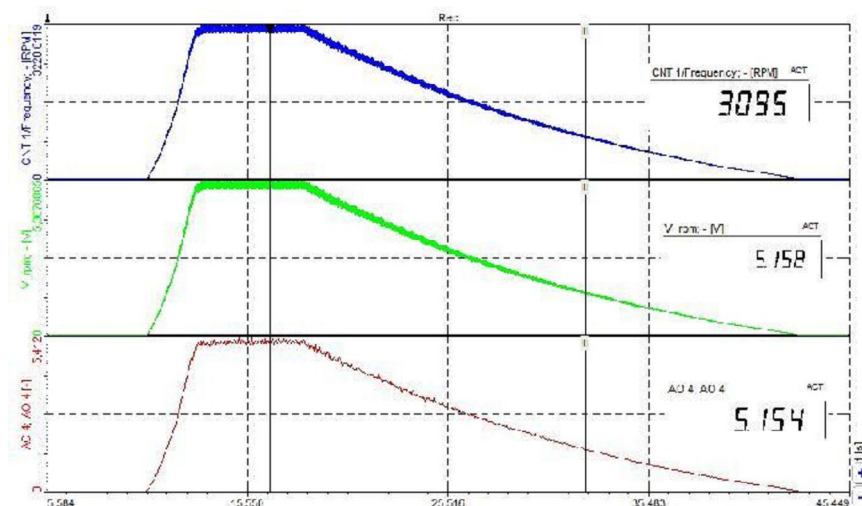
The max measured RPM is 3095, which equals 5,15V.

Also on the scope you see the correct max RPM (approx. 5,2 V).

Of course the scope resolution is only 8 bit…

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For support please contact support at dewesoft com.