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Tests of Hantek CC-65 Current Probe

I started with using Siglent waveform generator to provide current for testing the probe.

First, I set the output voltage of the first channel to 20V pk-pk, and shorted the output by wires. CC-65 measured current in one of the wires.
CC-65 was connected to Channel 1 of the Rigol Scope.

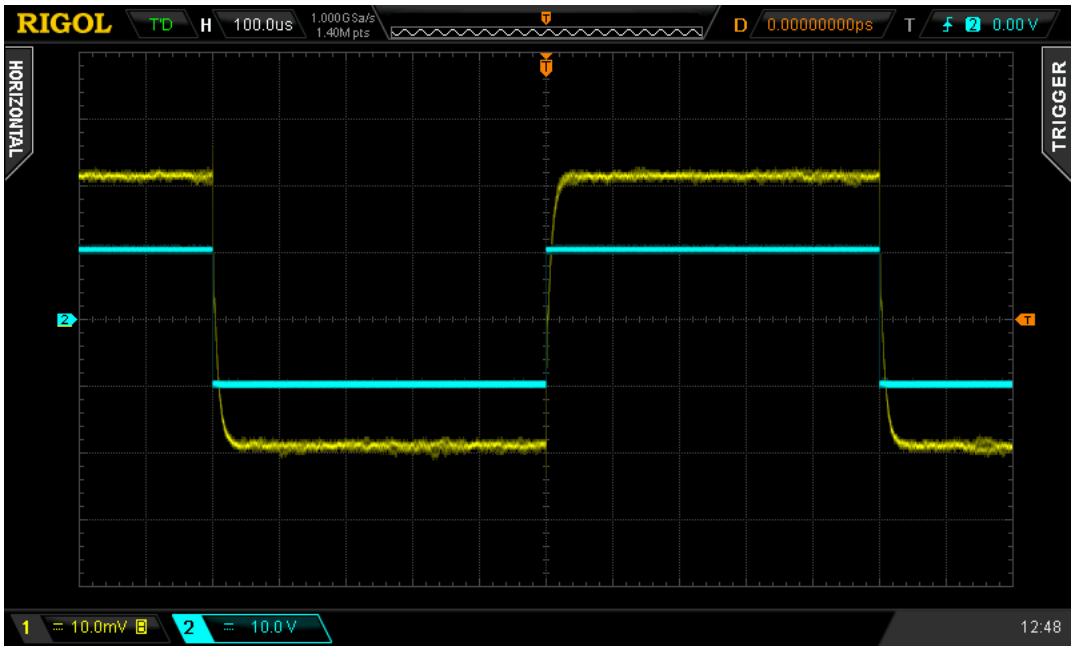
Channel 2 of the Rigol scope was connected by BNC cable to Channel 2 of the Siglent waveform generator.

The Siglent was set to copy parameters of Channel 1 to Channel 2.

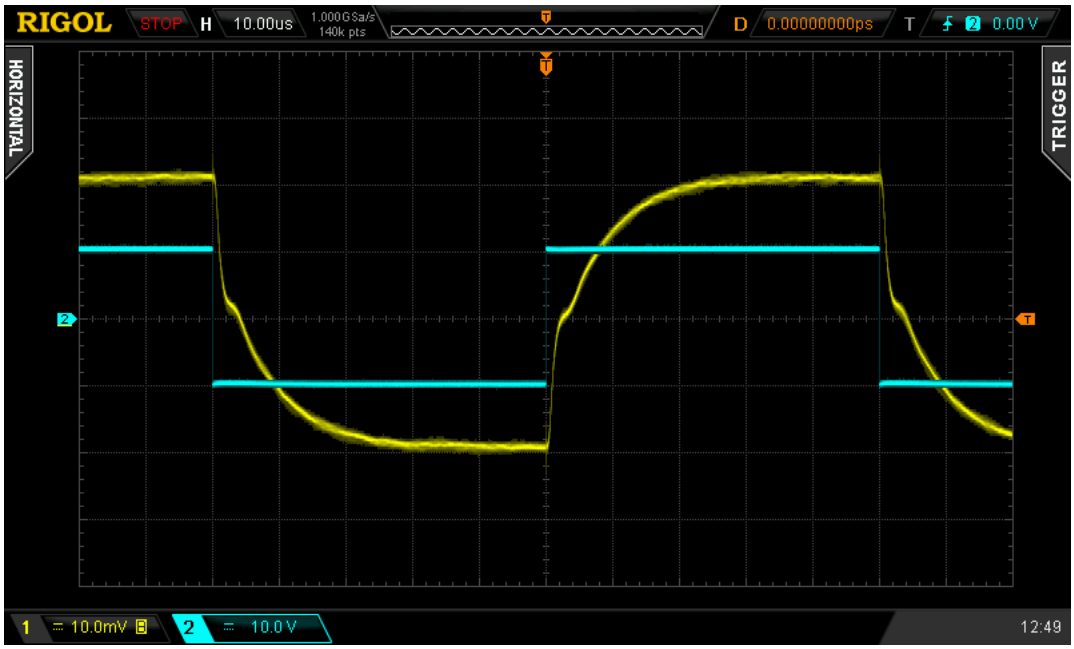
As output resistance of Siglent is 50 ohm, the current was equal to set output voltage divided by 50 ohm, So, for 20V pk-pk the current was 400 mA pk-pk.

On the screenshots below Siglent voltage is shown by blue, and CC-65 current by yellow.

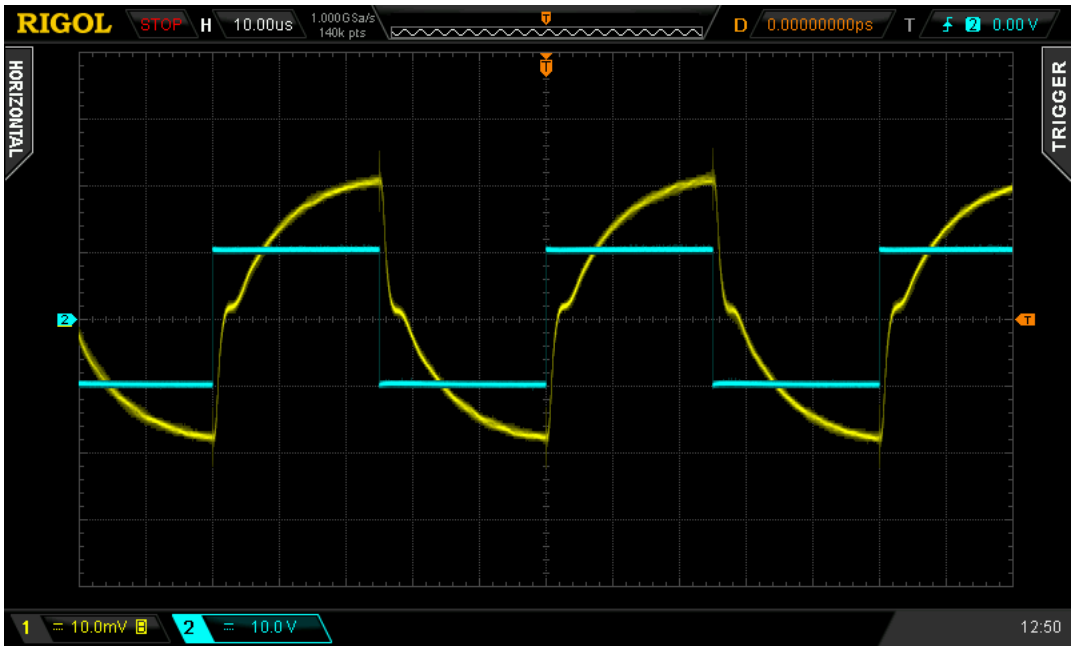
At 1 kHz square signal current and voltage are shown here:



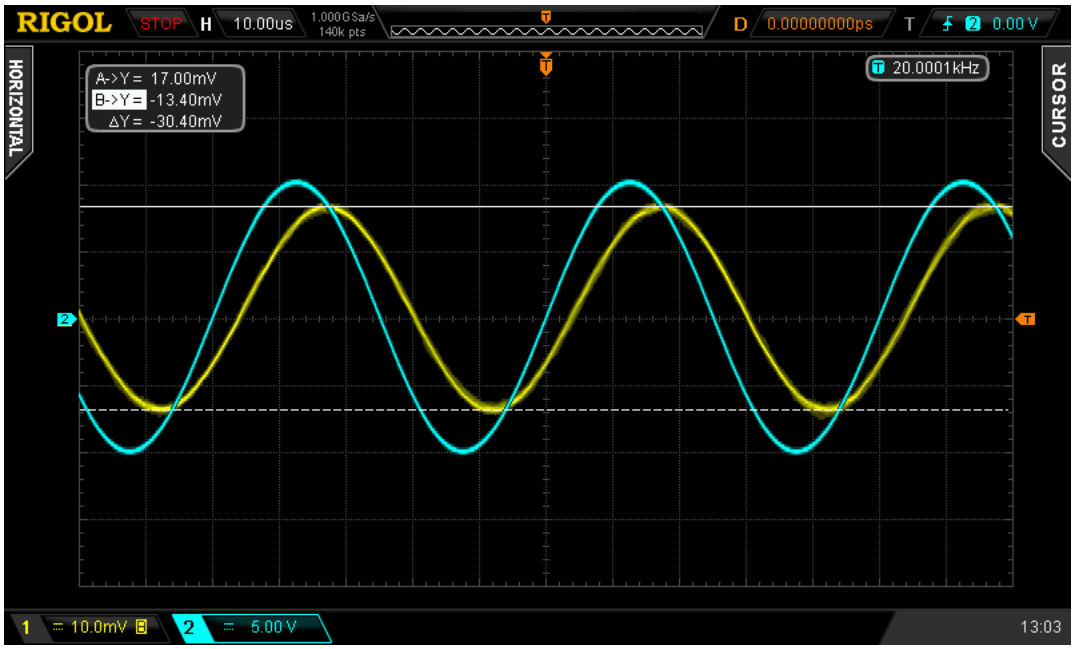
The CC-65 rise and fall times are about 20 uS.
They can be seen at 10 kHz screenshot:



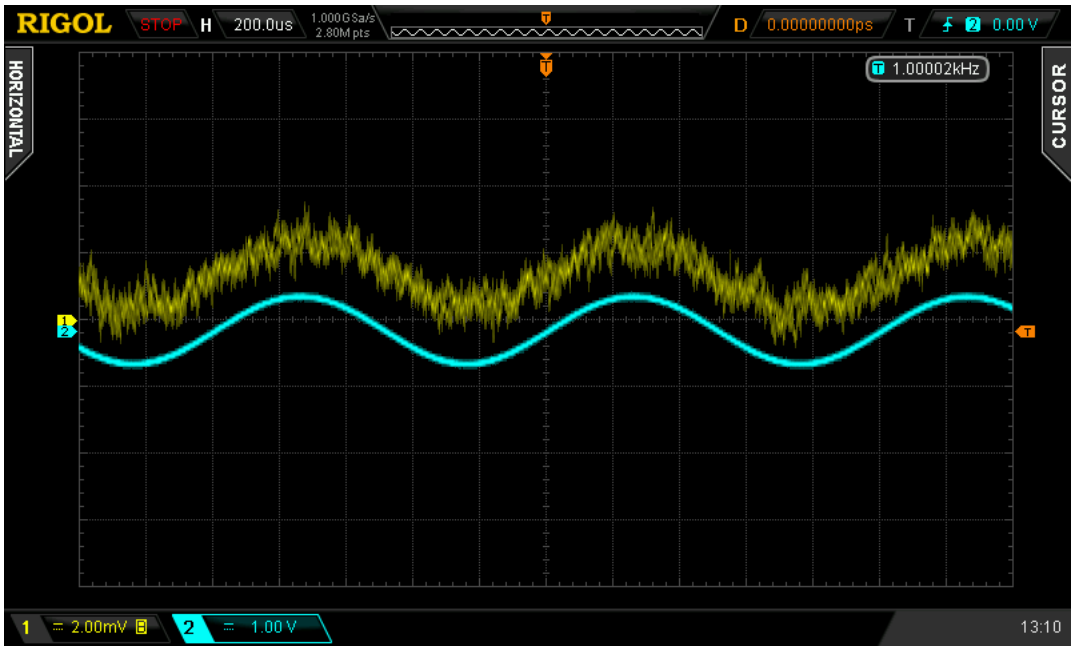
Even at 20 kHz signal still has correct amplitude:



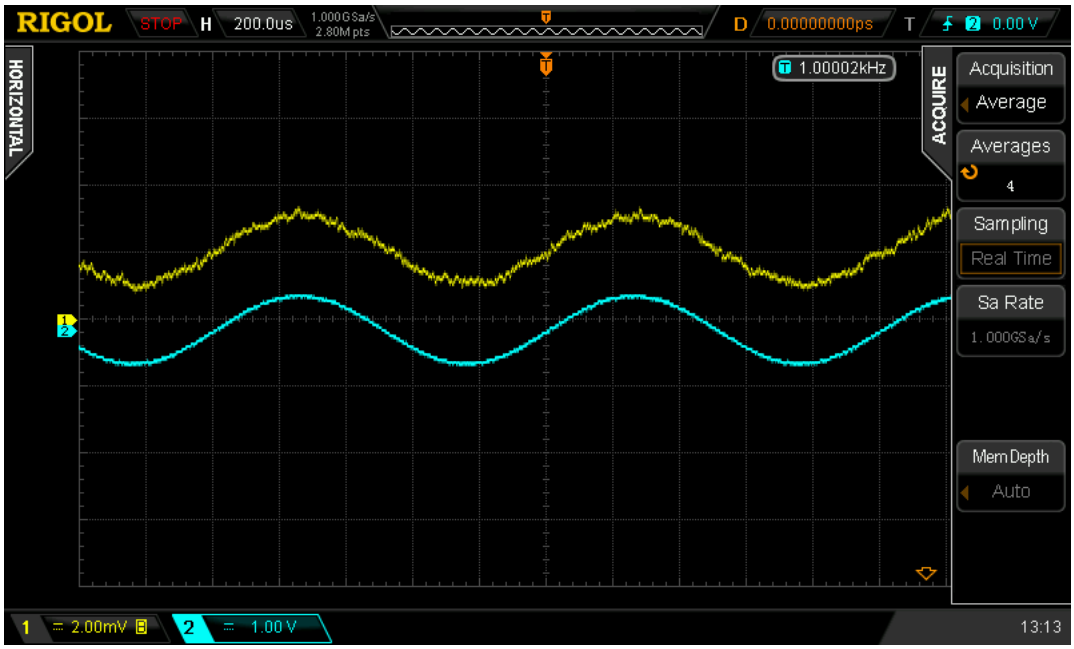
For sinusoidal signals bandwidth is larger than 20 kHz:



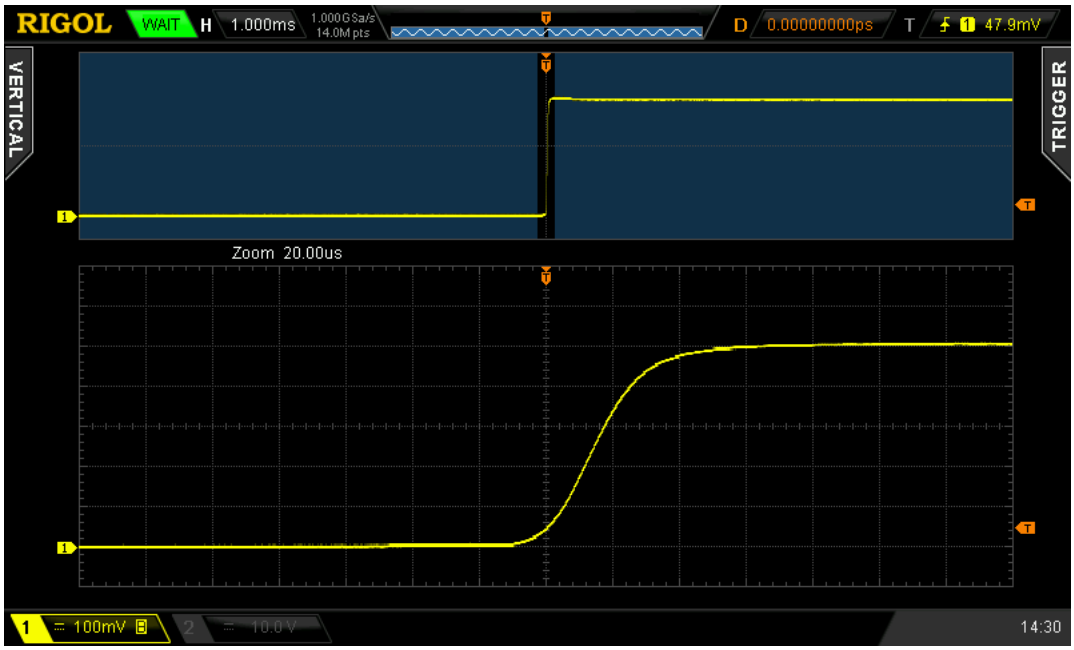
Small sinusoidal signal with 20 mA pk-pk is easy to see even without averaging:



Averaging 4 times makes it even better:

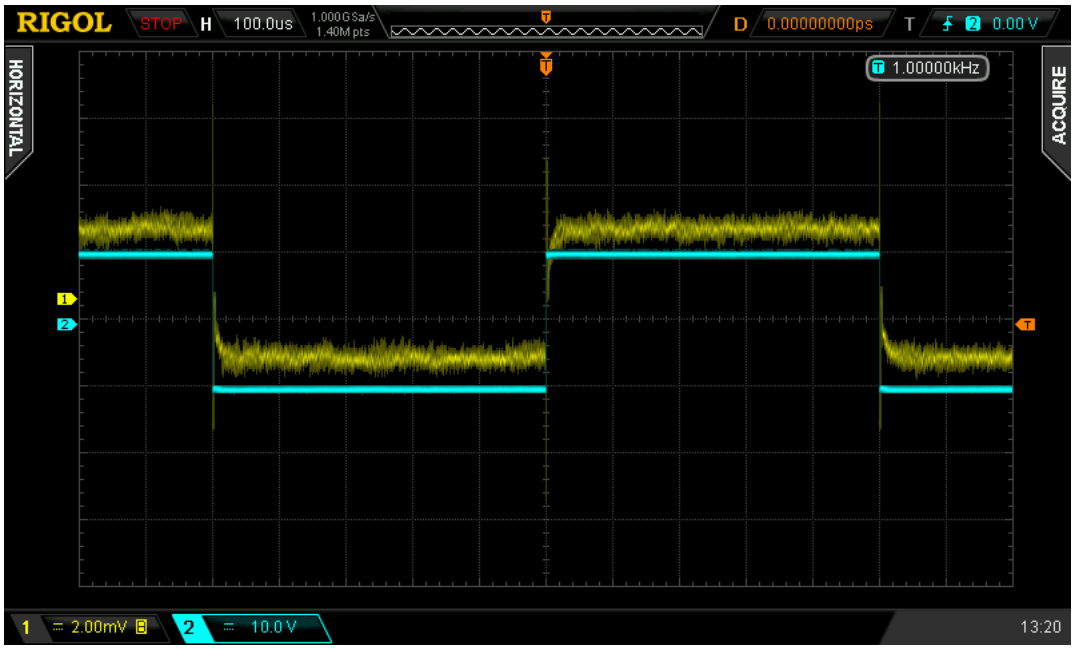


Large current response was tested with source meter, so the current was limited to 5A:

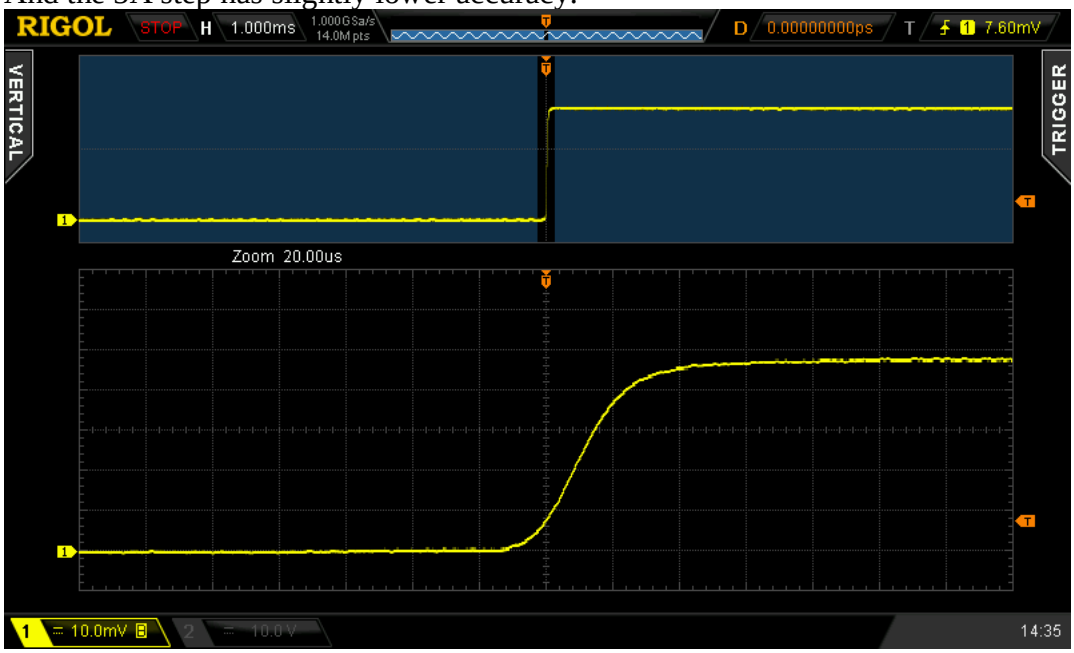


All the tests above were done using **1mV/10 mA** setting.

Small signal at **1mV/100 mA** setting looks this way:



And the 5A step has slightly lower accuracy:

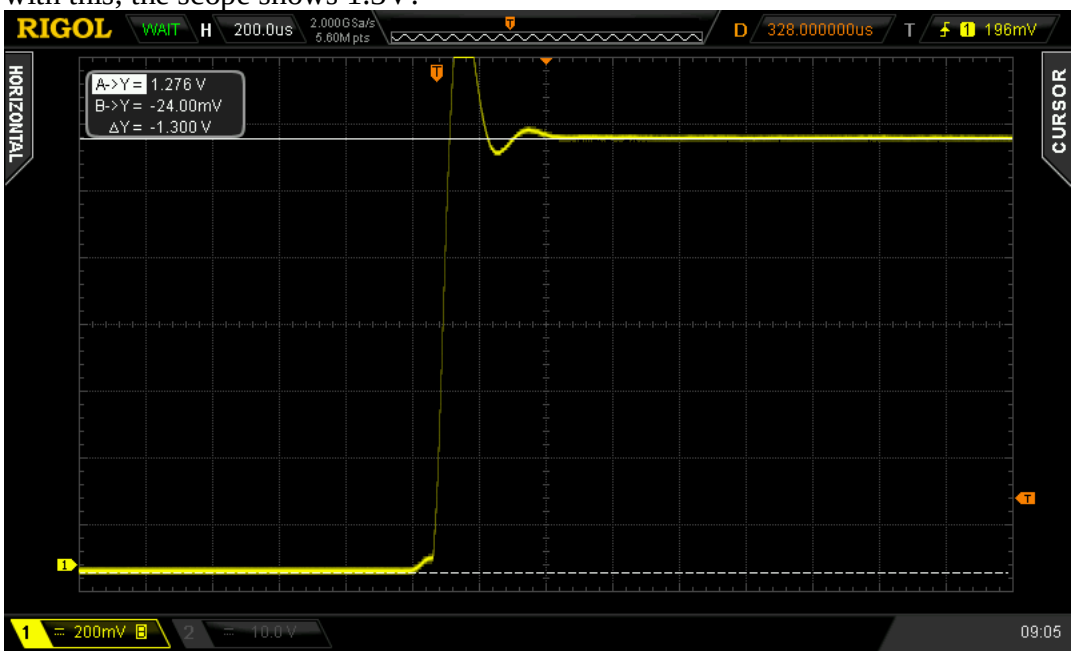


Large current saturation and measurement errors

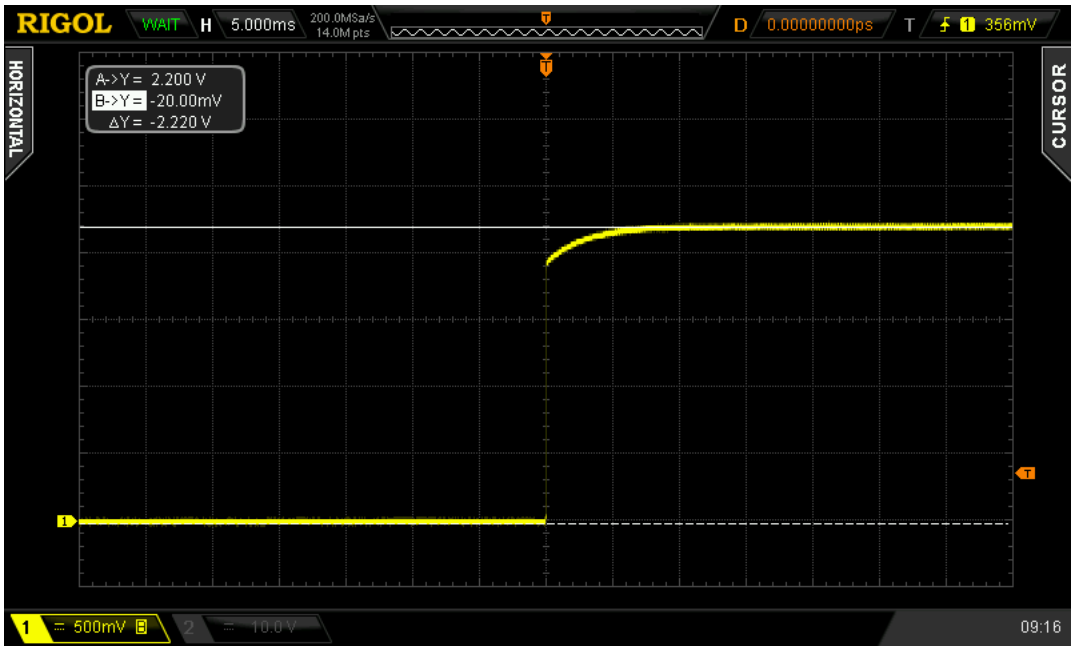
Current being measured by CC-65 can be increased using several turns of wire inside the probe opening.
I used coil with 13 turns.

I tested it using current from Source Meter.
First measurements were made with CC-65 setting of **1mV/10mA**.

For 1A from Source Meter the measured current should be 13A. In perfect agreement with this, the scope shows 1.3V:



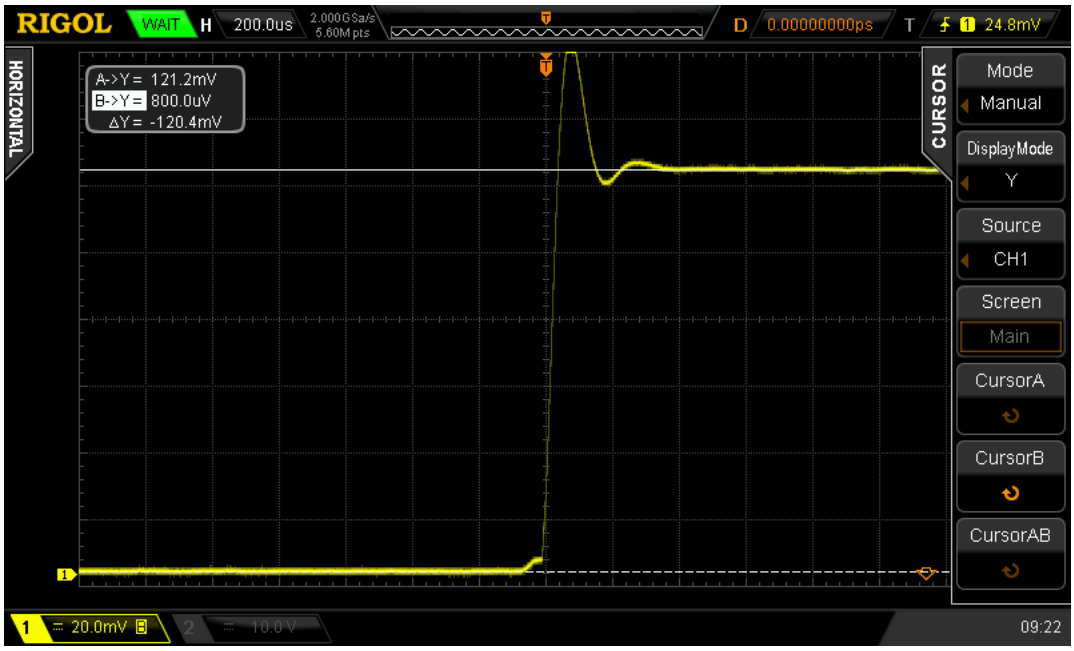
With 1.54A the measured current should be **20A**, and the voltage should be 1.77V. This, indeed, was observed. However, this seems to be **saturation level**. At 1.74A measured voltage should be 2.26V. In reality it takes large time, about 7 mS, for the voltage to reach 2.22V from fast step of about 1.8V:



Further increase of the Source Meter current does not change this curve.

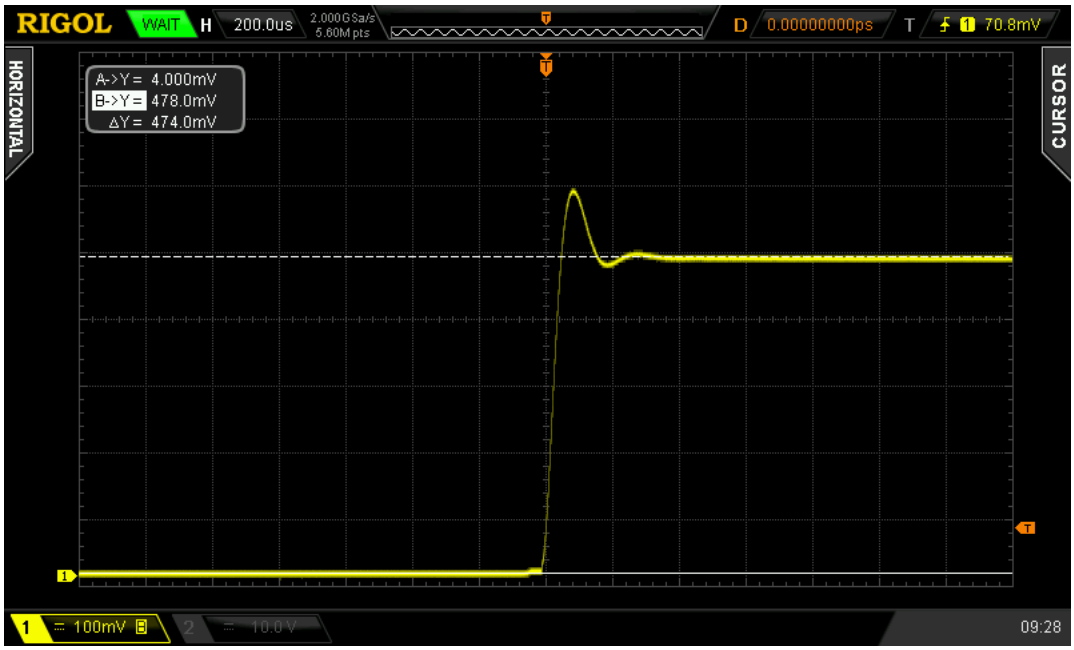
It is natural to expect that less sensitive setting of **1mV/100mA** will not be saturated at 20A, and up to the declared upper current limit of 65A.

At **1mV/100mA** and 1A from the Source Meter the output voltage should be 130 mV. The measurement result is shown here:

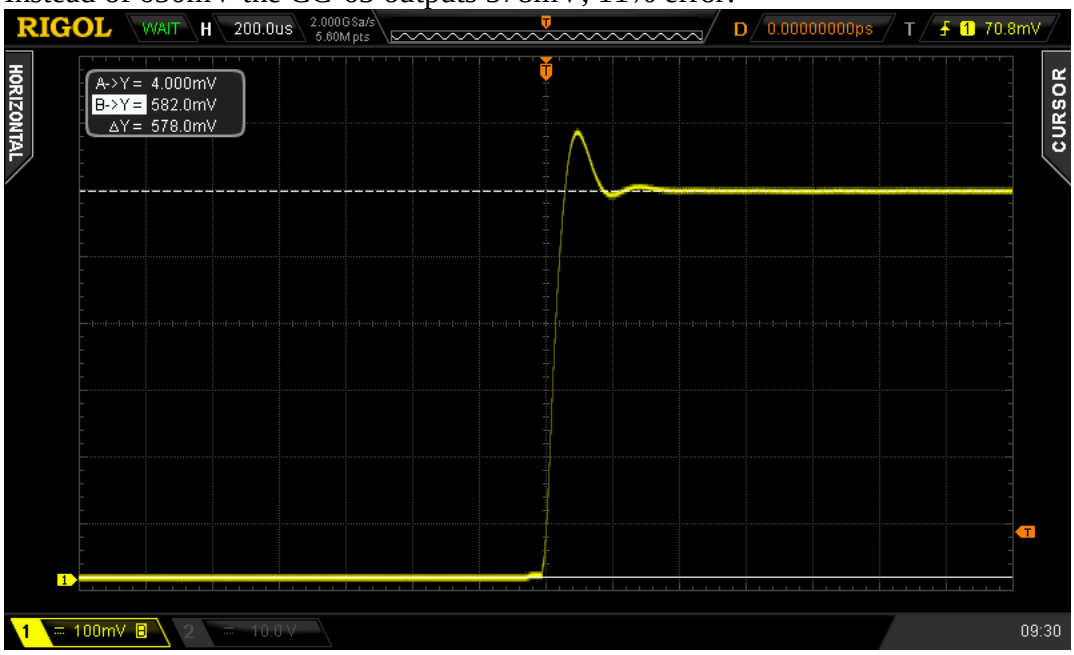


We see that at **1mV/100mA** the measured current is about 8% lower than the actual current

The error increases to 10% for 4A from the Source Meter. Indeed, the voltage should be 4*13/100=520 mV, while measured voltage is 474mV:

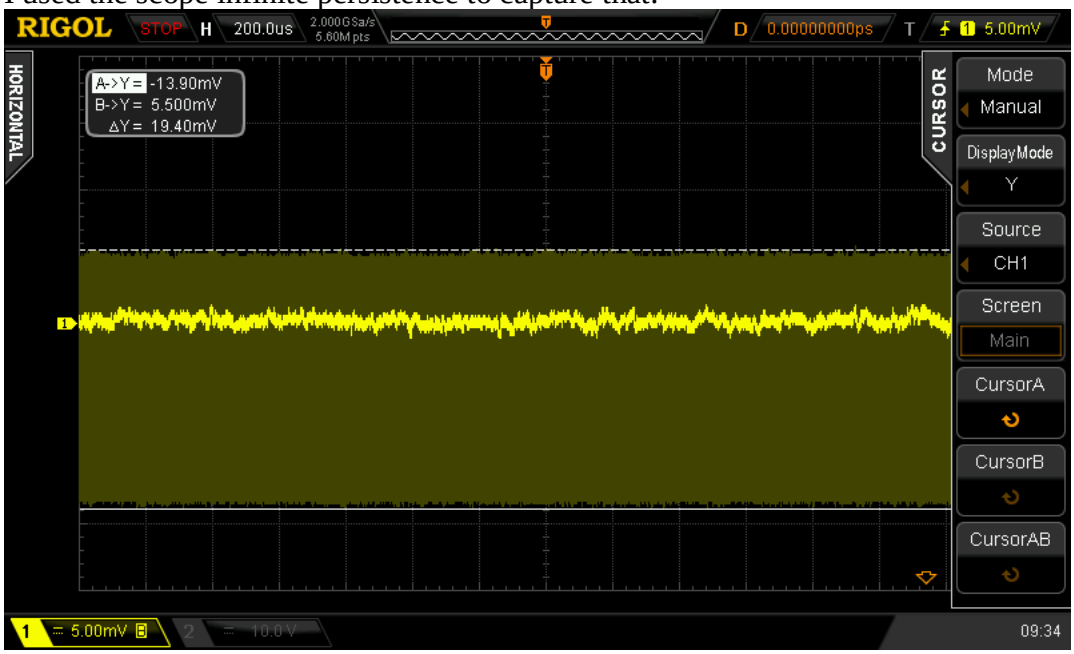


At the top of CC-65 current measurement range, 65A, current from the Source Meter is set to 5A.
Instead of 650mV the CC-65 outputs 578mV, 11% error:



Earth magnetic field influence.

Finally, it is interesting to find how much CC-65 orientation relative to the Earth's magnetic field changes the output voltage at the sensitive setting of **1mV/10mA**.
I used the scope infinite persistence to capture that:



We see that the Earth's magnetic field may change the result by 20mV, or 200mA.
So, CC-65 should not be moved during measurements.