Application Note

Recording Spring-Charging Motor Current Waveform

If needed to record a spring-charging motor current waveform of a circuit breaker operating mechanism, use one of the CAT instruments that includes the analog channel. In addition, this measurement requires using the current clamp accessory. Please use only the original current clamps that are delivered with the device.

The proper connection of the CAT device to the circuit breaker control circuit providing the spring-charging motor current waveform is presented in the Figure 1.
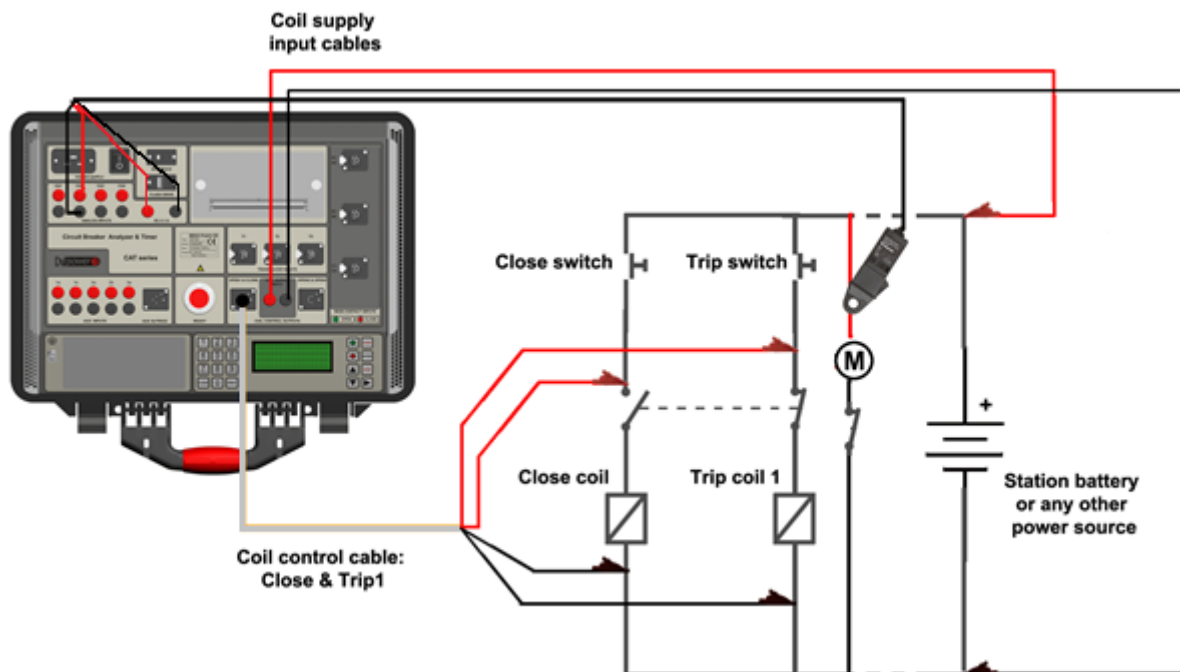

Figure 1. Connection diagram for the spring-charging motor current waveform recording

Inside the motor control circuit there is the contact (limit switch) connecting or disconnecting the motor from the power supply, depending on whether the closing spring is being discharged or charged. When the circuit breaker main contacts close, the closing spring discharges and this contact closes (motor is connected to the power supply) providing recharging of the closing spring. When the closing spring is charged, this contact (limit switch) opens, the motor stops to run and charge the closing spring, which is in that way prevented from further charging and being damaged.

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Recording Principle

The spring-charging motor current waveform can be recorded only when using the DV-Win software. Connect the CAT device to the computer using the USB cable and start a new test by selecting the *Start new test* button (Figure 2).
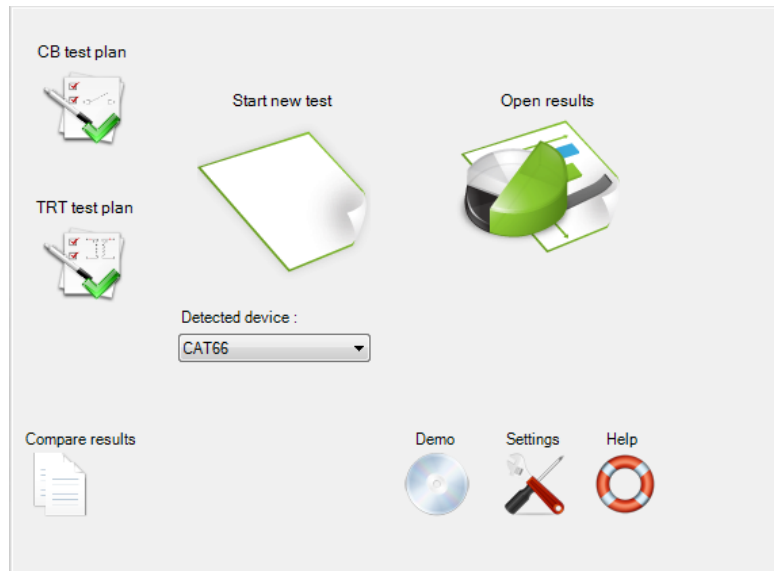

Figure 2. Starting a new test

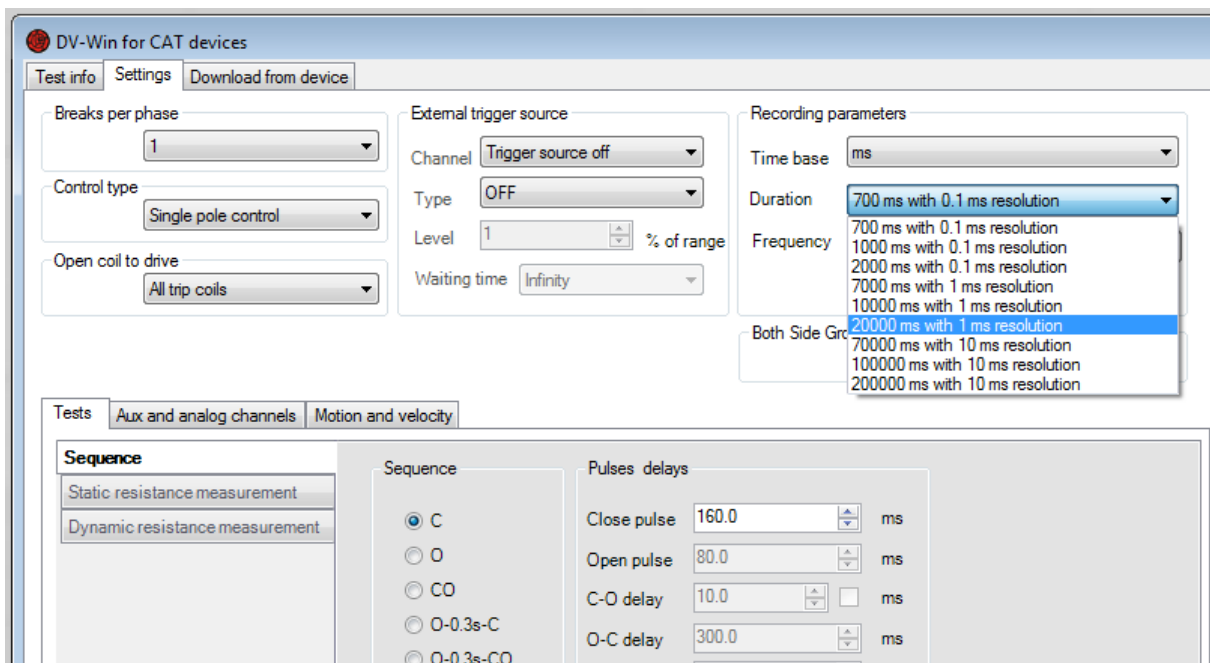Next, the recording time duration needs to be set up and *C* operation selected, as it is illustrated in the Figure 3.

Figure 3. Setting the recording parameters

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Most the circuit breaker spring mechanisms can be charged in less than 10 s, but according to the standard (IEC 62271-100) this time should be less than 15 s. Bearing this in mind the test duration needs to be set to 20 s (1 ms recording resolution and sampling rate 1 kHz in this case). The exact spring mechanism charging time is given in the circuit breaker specifications provided by the manufacturer.

A desired analog channel on the CAT device which will be used for the motor current recording needs to be selected and the right parameters set up. The **Transfer function** field for the selected analog channel needs to be set with the same ratio value as it is selected on the current probe. In the example given in the Figure 4 the **Transfer function** field is set to 10 mV/A since this ratio is selected on the current probe, too.
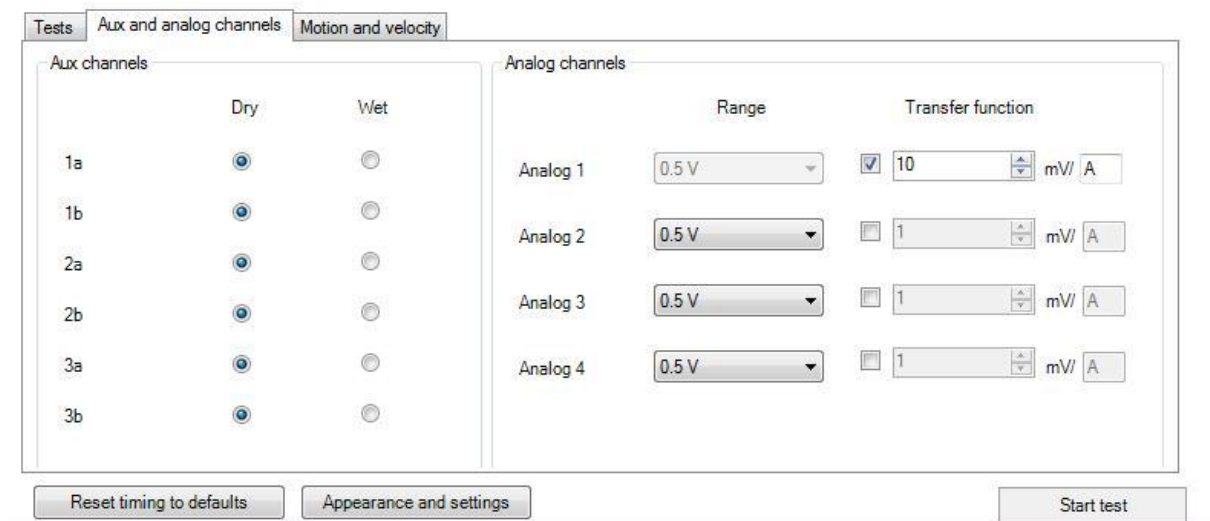

Figure 4. " Transfer function" field setting

After all the needed parameters have been set up, the **C** test can be started by selecting the **Start test** button. If everything is done right, the obtained result should look similar to the illustration in the Figure 5 (if only the graphs of the coil current, main contacts and selected analog channels are enabled). From this graph it can be seen that charging time is about 10 s, since at that moment the current is interrupted announcing the closing spring is charged.

The zoomed in motor current waveform of the same graph is given in the Figure 6 (only the analog channel enabled and used for motor current recording). The highest peak on the graph represents the starting (inrush) current having a value of approximately 6 A (depends on the motor type). The charging (running) current is represented by the rest of the signal with the value of around 1 A (depends on the motor type).
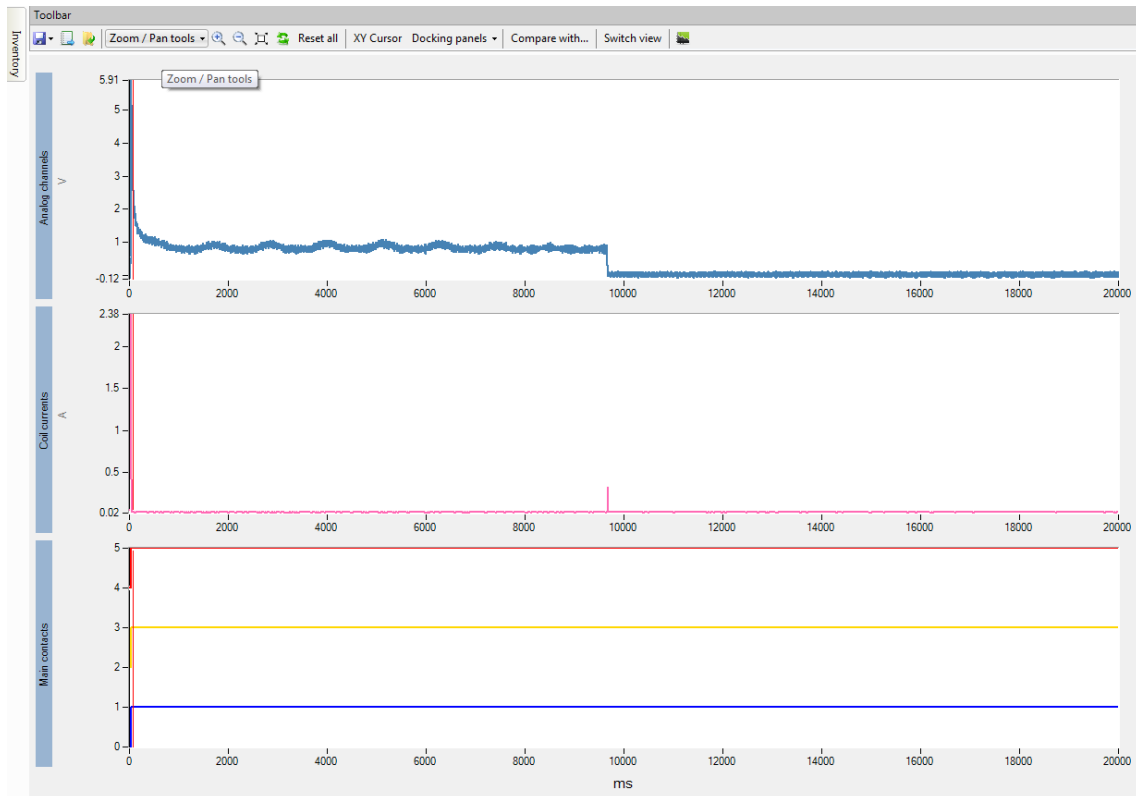
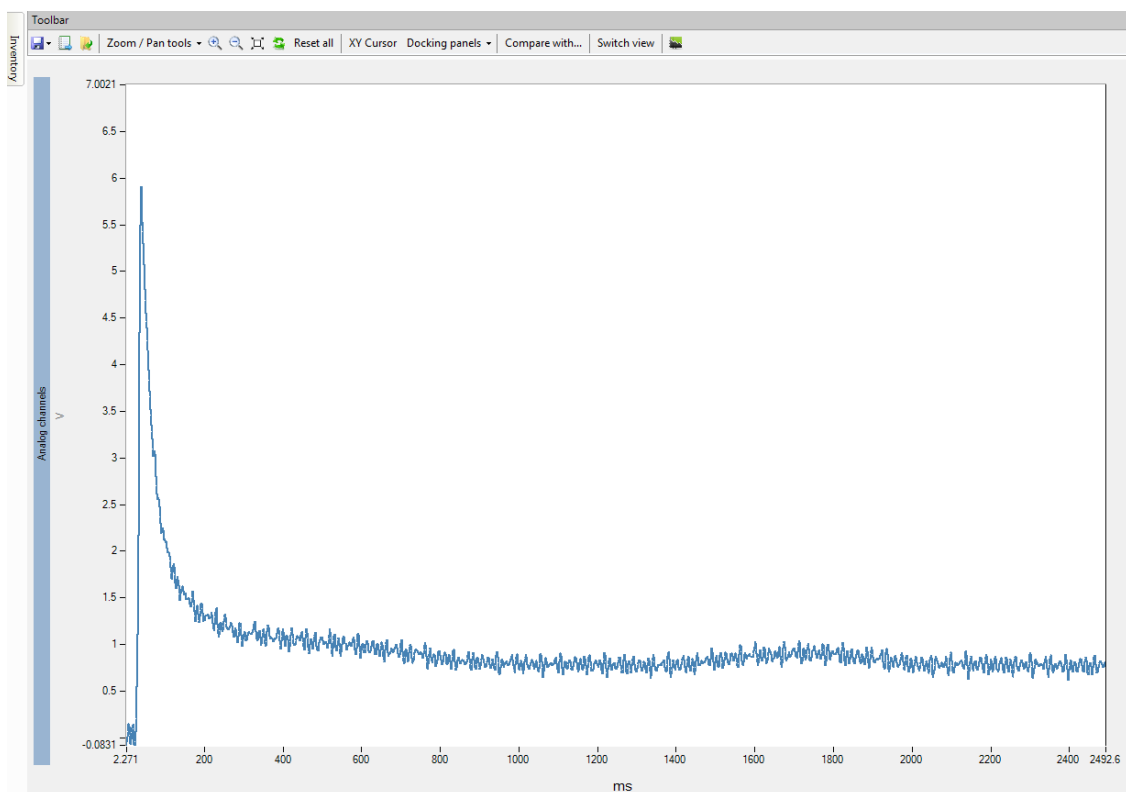Figure 5. Graphical results obtained with the CAT device

Figure 6. Spring-charging motor current waveform graph example

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