Quality check of the feedback angle measurement

During operation of the UniTek BAMOCAR D3 devices in combination with EMRAX motors, many engineers experience unwanted problems such as loud noise and a high current during stand still. The general cause of this effect has its origin from poor or even completely missing shielding of the feedback (usually resolver) signals. High precision angle measurement and noiseless data transfer from the cables are the most important factors of a correct working current controller. A strong restless oscillating current with sudden high peaks, which can cause emergency shutdowns of the power modules, is the direct consequence of an angle signal with a strong noise. These problems are even enhanced during an increase of the rotational speed. The biggest source of interference in the system is the inverter. It is responsible for that the motor cables are constantly switched between +Ub und –Ub.
Very often the connection of a resolver consists of only 6 small unshielded cables and it is the responsibility of the engineer to connect them to the BAMOCAR D3 device properly and correct any possible EMI problems. There is a way to control the quality of the received angle feedback signals using the NDrive oscilloscope.

Step 1 – Measurement with noise:

- Configure the oscilloscope to a Timescale of 10 ms, use Single capture option and configure the trigger to a rising edge at eg. 4900 of Chan2 (N actual).
- Make sure to measure the Channel “incr_delta” (U/Div=500) and start measurement (->Run).
- Use the digital speed command of 5000 to accelerate the motor and a single measurement should be triggert. This measurement is about half a motor rotation.

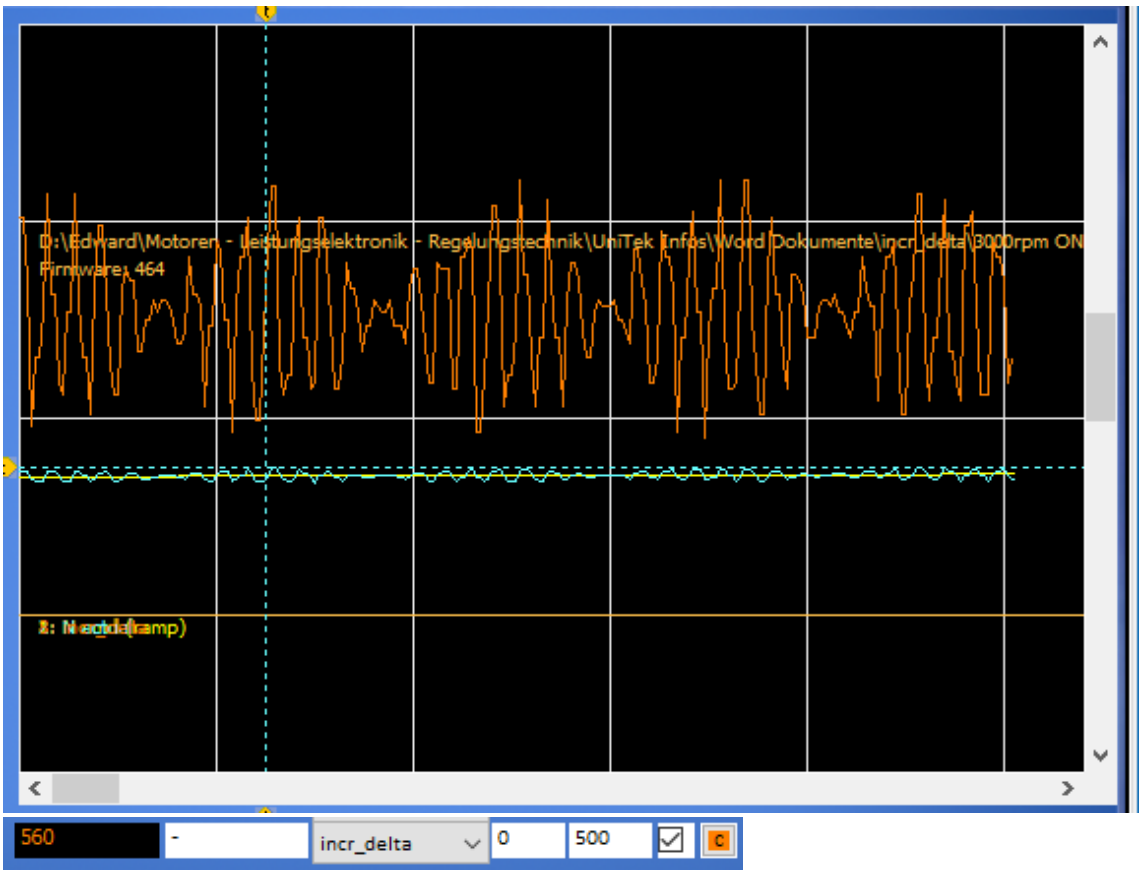
The Signal „incr_delta“, is the calculated difference of the feedback angle of two follow up measurements. At constant rotational speed the value of this signal should also be roughly constant with a small jittering. To compare the general influence of the inverter a second measurement at roughly the same rotational speed with a disabled inverter needs to be done. This can be done by doing a measurement right after the rotating motor is disabled and the motor can run freely just by its inertia.

Step 2 – Measurement without noise:

- The second measurement is almost the same except that you trigger on the falling edge at e.g. 4900 of Chan2 (N actual).
- Ensure that the option of coast-stop is set to ON.
- Accelerate the motor to 5000, start measurement (->Run) and disable the drive by either setting RUN input to logic 0 or by pressing “Dis” inside NDrive.
- Now with a second measurement of „incr_delta“, with no EMI interference of the inverter, the differences of its value can be compared with the first measurement.

The negative effect of the noise can be seen by comparing both measurements. By decreasing the noise through improved shielding, the amplitude if jittering of the “incr_delta” signal will reduce, signal quality and thus current control operation will improve.
(Connect the shield of the feedback cable to the BAMOCAR-D3 GND connector. Do not forget to connect the motor casing together with the controller casing to earth ground using the same separate cable.)

Example measuremnet **with noise**:



Example measurement **without noise**: