16bit SIN/COS Encoder converter - Interpolator with Hall commutation signal outputs

Overview

The **NL-NQ8D** is an advanced interpolator compatible with all types of 1Vpp Sin/Cos encoders. Designed for DIN-rail mounting, it converts analog 1Vpp Sin/Cos signals into 5V TTL digital quadrature (A/B) outputs. It can also convert these analog signals into BiSS-C or SSI digital protocols. Programmable UVW commutation outputs are available, supporting 1 to 32 pole pairs.

This device is essential when a servo drive cannot directly accept a 1Vpp Sin/Cos signal as its feedback interface.



Programming interface - Driver & Software

The interpolator can be programmed using the programming cable DE23500555-1M in combination with programming software.

The programming cable Windows driver can be downloaded here:

:miniature_motors:usb_mb3u_driver_ftdi21224.zip

Features:

Item
Resolution of up to 16384 angle steps per sine period
Binary and decimal resolution settings, e.g. 500, 512, 1000, 1024; programmable angle hysteresis
Count-safe vector follower principle, real-time system with 80 MHz sampling rate
Direct sensor connection; selectable input gain
Rail-to-rail input (frequency of up to 500 kHz)
Calibration for offset, amplitude, phase and distortion
A/B quadrature signals of up to 10 MHz with adjustable minimum transition distance
Up to 32-bit period counting with zero processing or absolute data interface
Absolute angle output via fast serial interface (BiSS, SSI, SPI)
Permanent bidirectional memory access to parameters and OEM data via BiSS C
Error monitoring of frequency, amplitude and configuration
ESD protection and TTL-/CMOS-compatible outputs

Status LEDs

The ERR LED (RED COLOR) reports an error condition configurable with the GUI interface — for example, a SIN/COS signal too low or out of range. The PWD LED (GREEN COLOR) reports the power-on of the interpolator: if the green LED blinks, the 5V voltage is not stable or the current is too weak.



Connectors

X1 connector is male d-sub 15 HD, X2 connector is female d-sub 9, X3 connector is female d-sub 15.

X1 Connector - Incremental Output AB e UVW commutation signals

Pin	Signal	Description
1	A+	Positive A
2	A-	Negative A
3	B+	Positive B
4	B-	Negative B
5	NERR	Error Input/Output, active low
6	+5VDC	Power supply
7	GND	Ground
8	U+	Positive commutation U
9	U-	Negative commutation U
10	V+	Positive commutation V
11	V-	Negative commutation V
12	W+	Positive commutation W
13	W-	Negative commutation W
14	Z+	Positive Z
15	Z-	Negative Z

X4 Connector - BiSS-C Bus - INTERPOLATOR IC1

This port is used to program and read the data from the first interpolator IC, which generates the emulation signal ABZ with adjustable resolution, as encoder feedback for the servo drive.

Pin	Signal	Description
1	-	-
2	MA+	Clock P
3	MA-	Clock N
4	VDD	5V Logic
5	MO-	Master data output N
6	GND	Ground
7	SL+	Device Data input P
8	SL-	Device Data output P
9	MO+	Master data output P

X2 Connector - BiSS-C Bus - INTERPOLATOR IC2

This port is used to program and read the data from the second interpolator IC, which generates the emulation signal UVW with adjustable resolution for motor commutation.

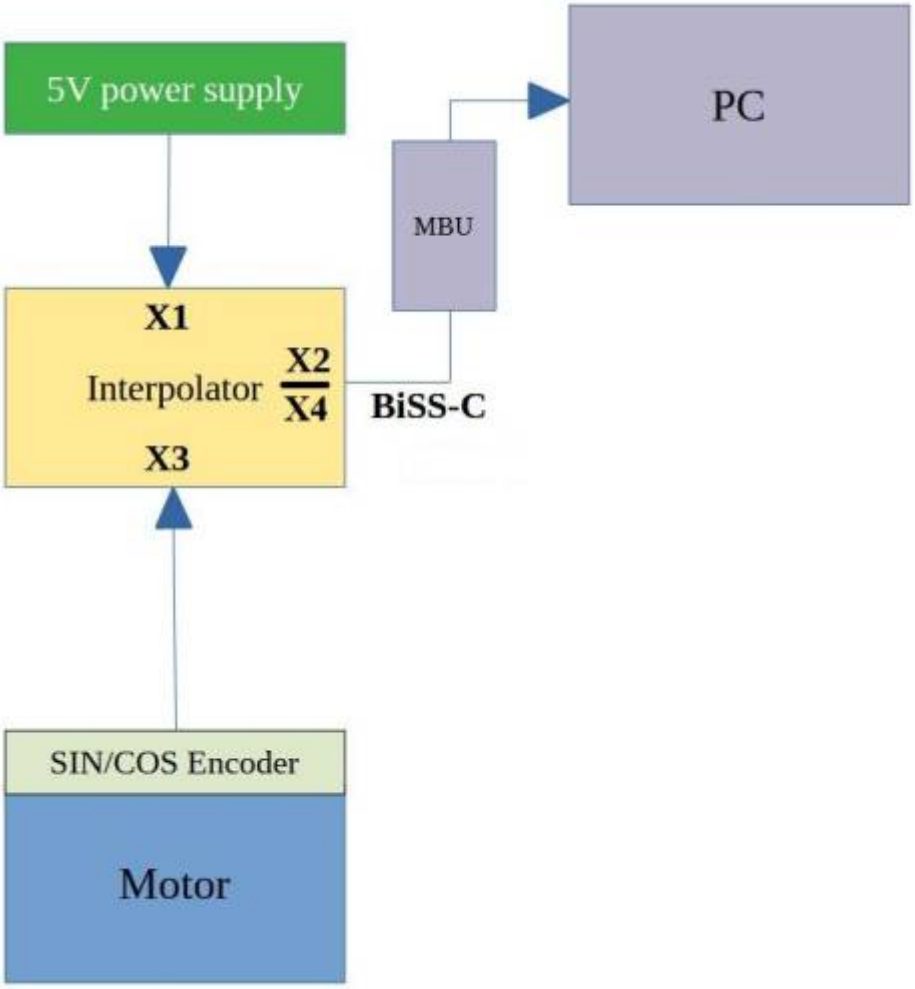
Pin	Signal	Description
1	-	-
2	MA+	Clock P
3	MA-	Clock N
4	VDD	5V Logic
5	MO-	Master data output N
6	GND	Ground
7	SL+	Device Data input P
8	SL-	Device Data output P
9	MO+	Master data output P

X3 Connector - SIN/COS 1Vpp encoder input

Pin	Signal	Description
1	-	-
2	-	-
3	-	-
4	+5VDC	Encoder power supply
5	0V	Ground
6	SIN+	Positive sine
7	COS+	Positive cosine
8	-	-
9	PE	Shield
10	-	-
11	-	-
12	-	-
13	SIN-	Negative Sine
14	COS-	Negative Cosine
15	-	-

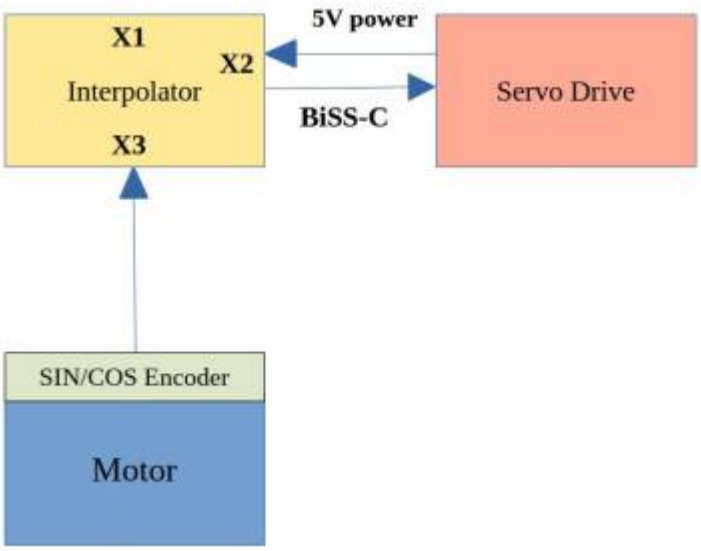
Using programming cable

When the programming cable is used, the power supply for the interpolator and the connected SIN/COS encoder can be provided by USB (in this case check that the current is sufficient for correct operation) or by an external 5V power supply connected on port X1.



Using Servo Drive

When connecting a servo drive BiSS interface, the 5V power can be provided by the feedback port of the servo drive, or by an external 5V power supply connected on port X1.

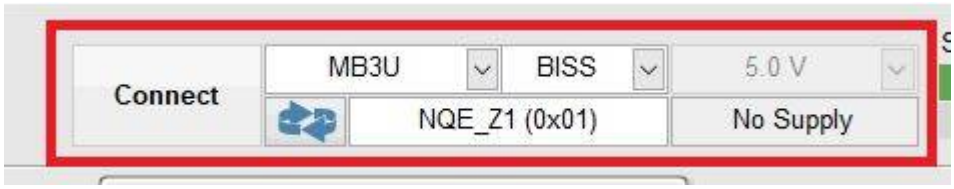


How to use the GUI interface - Quick start

To program the interpolator, use the GUI interface provided by NILAB ⇒ **NQE_1SO_gui.**

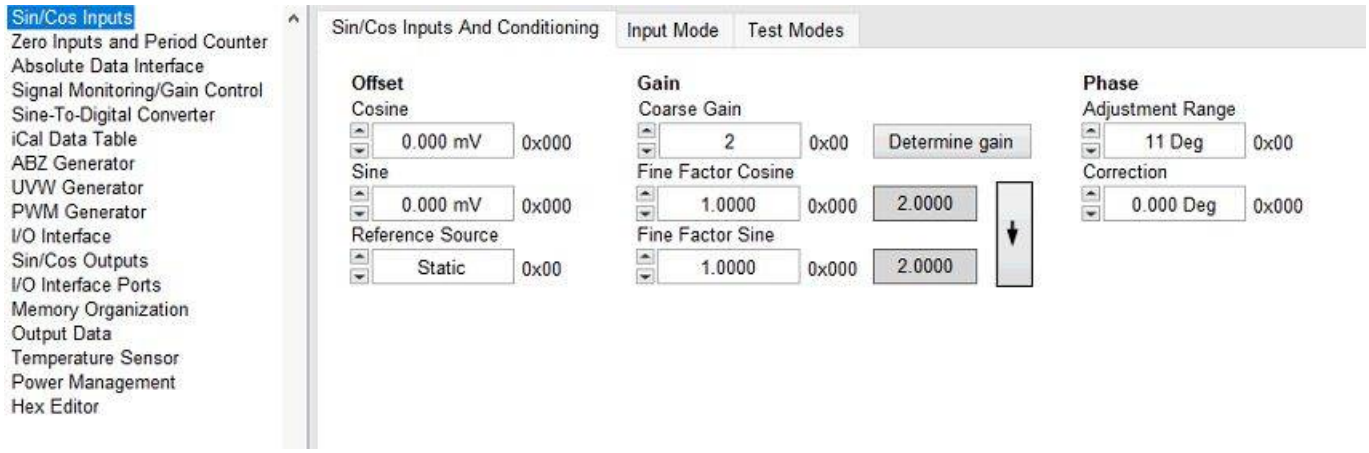
Interpolator connection using MB3U programmer (USB to BiSS)

On the top bar of the interface, select the MB3U interface and the BiSS communication channel. Then press the Connect button to read all the data from the interpolator.

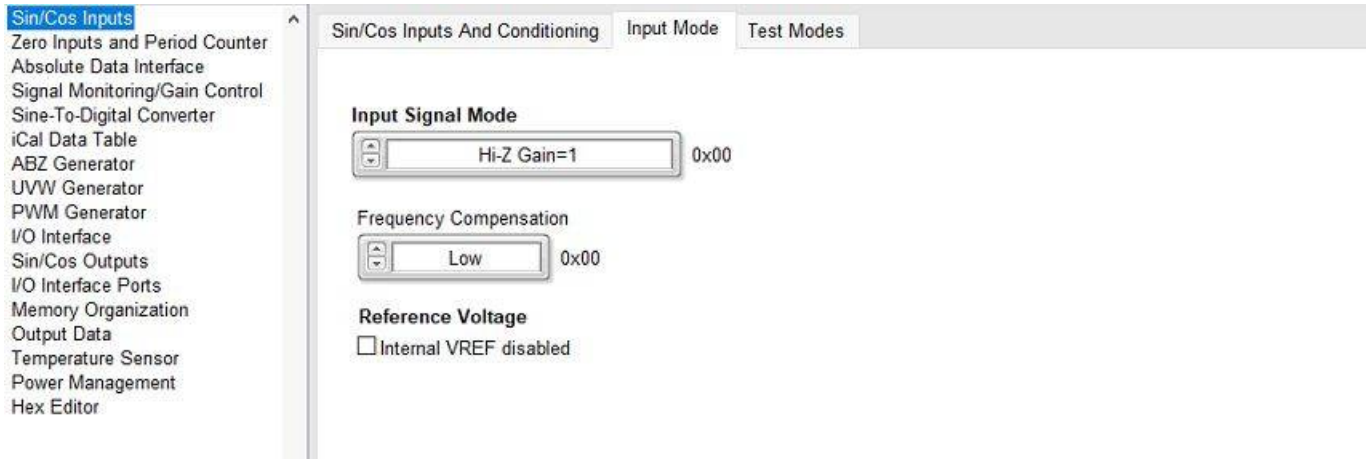


SIN/COS Inputs data - BiSS interface connected on port X4 or X2

If the input signal is a 1Vpp standard SIN/COS, select Coarse Gain to 2. The input signal offset can be nulled using the parameters Offset cosine or offset sine.

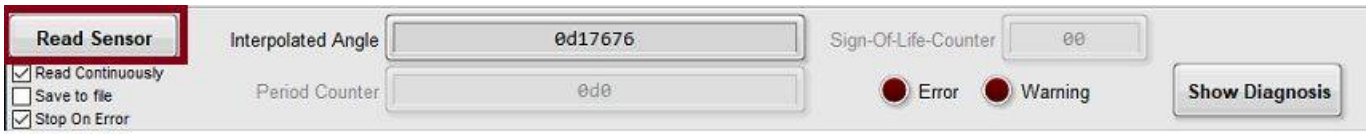


By selecting the input signal mode, the user can adapt the differential gain input to obtain a better signal-to-noise ratio.

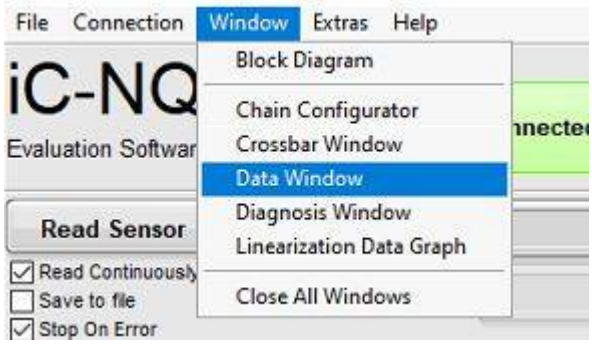


Check the SIN/COS signal input using the interface

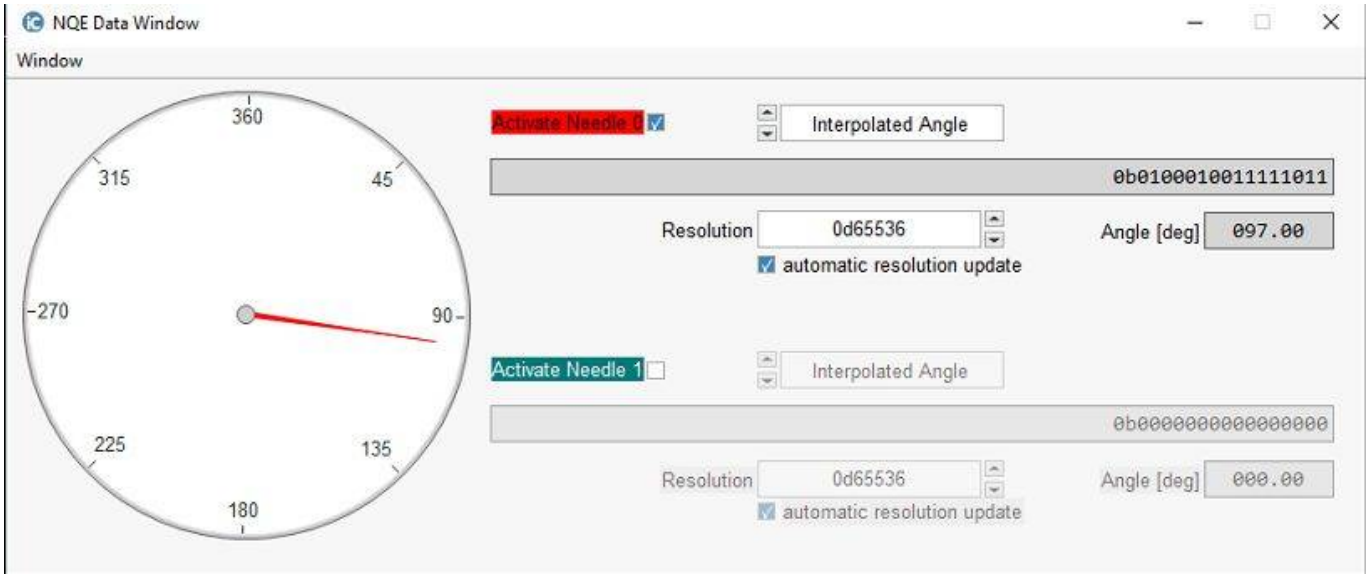
Click on the Read Sensor button to read the interpolated angle.



You can see the value on a gauge using the Data Window. Open the Data Window from the Window menu → Data Window.

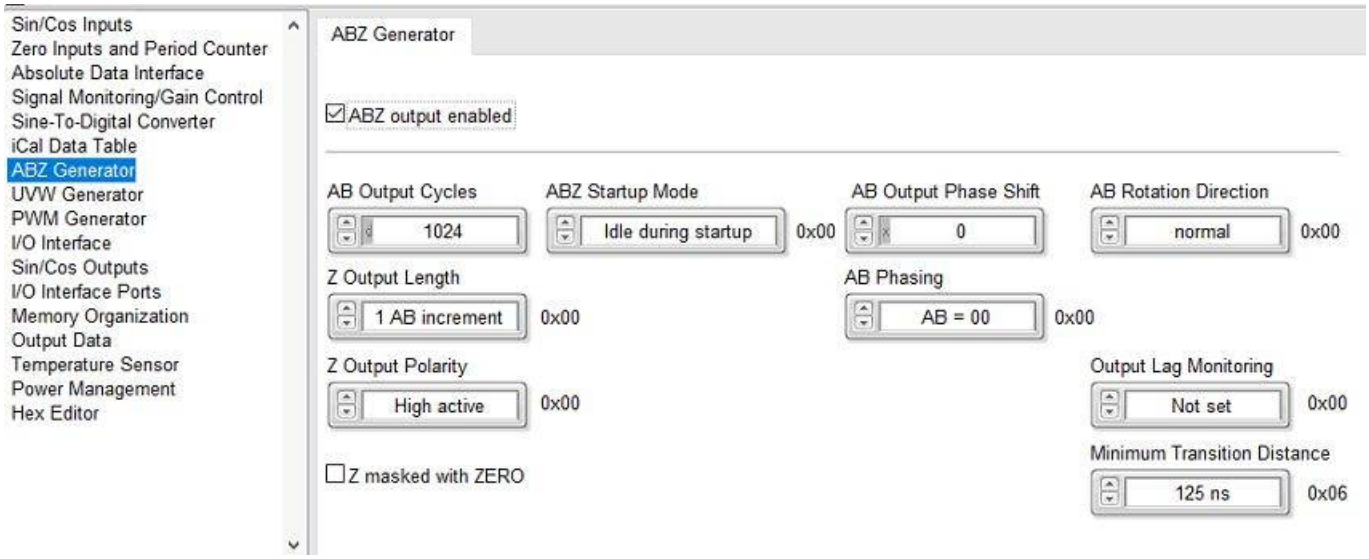


Moving the linear motor slider or rotary motor rotor, the gauge visualizes the electrical angle from 0 to 360 degrees. Check the value: when rotating, the measurement must be stable and smooth. You can increase or decrease the resolution to see the signal-to-noise ratio.



ABZ Generator for digital encoder emulation - BiSS interface connected on port X4

If you need the ABZ output active on the interpolator port X1, check the ABZ output enabled checkbox. The resolution of the AB output pulses is programmable using the AB Output Cycles parameter (here default 1024). Polarity, rotation, and the Z output are programmable as well.



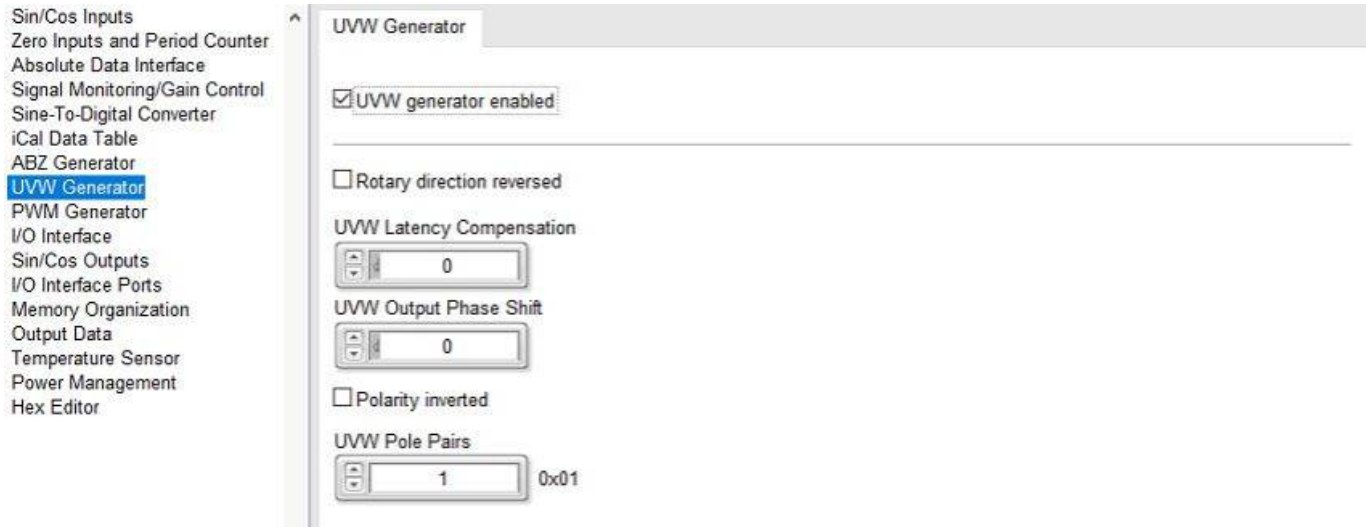
SIN/COS Output for UVW Emulation - BiSS interface connected on port X4

To use the second interpolator IC as a UVW generator, the SIN/COS outputs must be active.



UVW Generator - BiSS interface connected on port X2

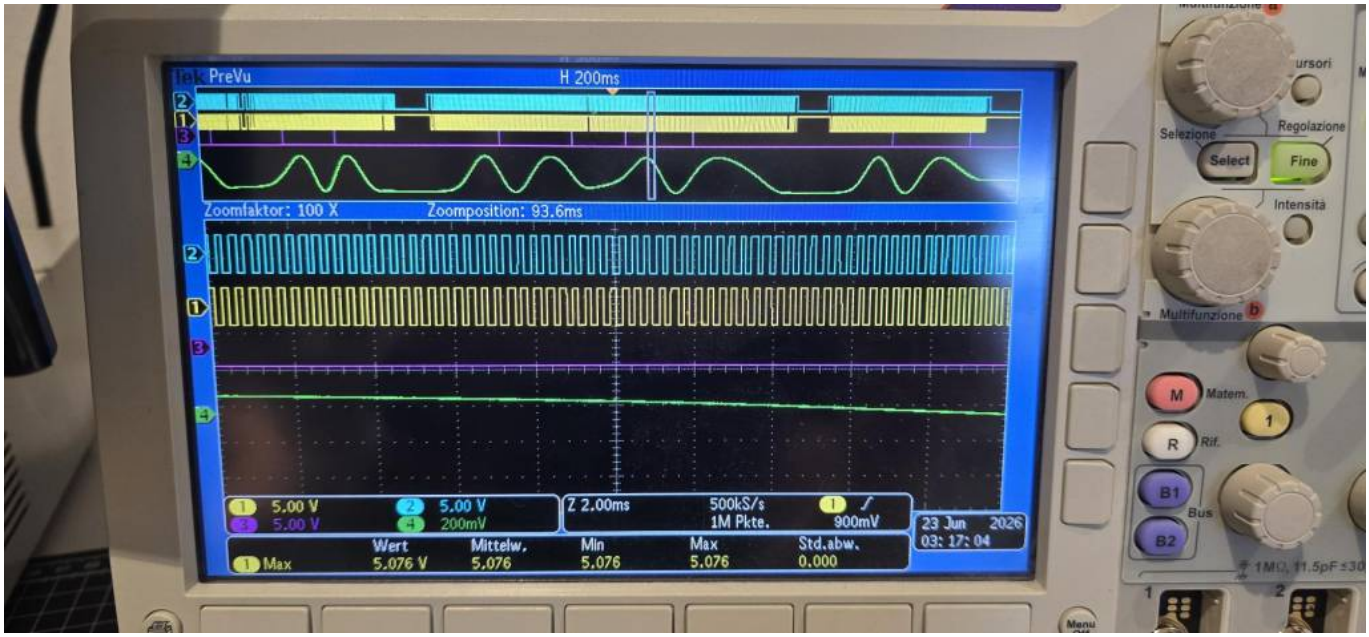
To activate the generation of UVW on port X1, check the UVW generator enabled checkbox. You can change the number of pole pairs according to the motor construction. Here the default for linear motors is 1.



Example of output signals

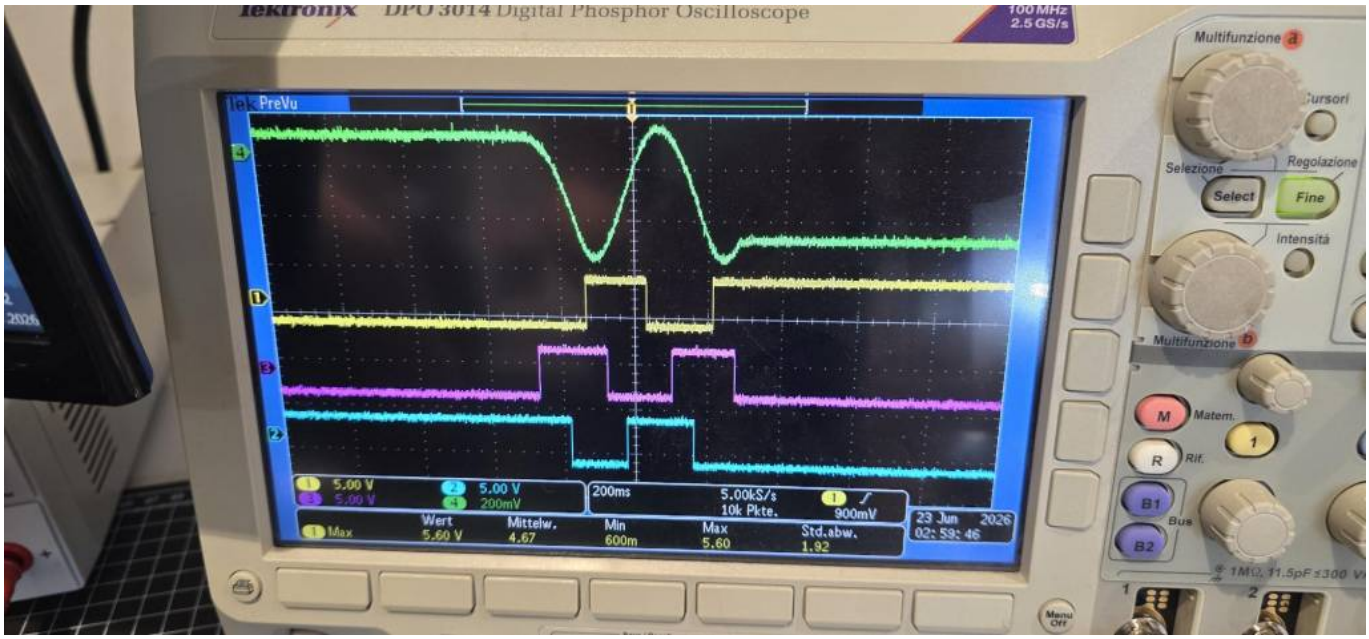
ABZ Signals with 512 pulses per cycle

Green is the Sine input signal; violet is the Z signal.



UVW Signals with 1 pole pair

Green is the Sine input signal; yellow, blue and violet are the UVW commutation signals.



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