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ENX QUAD 24

Product Information

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ENX 10 QUAD 24V – Product Information

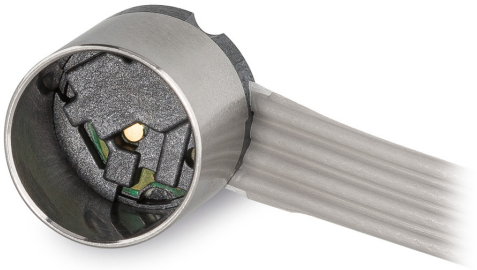

Figure 1 ENX 10 QUAD

The maxon QUAD encoder uses two standard Hall sensors to generate incremental quadrature output signals. They possess two channels (A, B) with single ended signals. The resolution is 1 impulse per turn. With quadrature encoding, 4 states per turn are available for detection of speed, direction, and position.

Size and dimensions are compatible with other Ø10 mm ENX encoders. The circuitry provides reverse polarity protection for the supply voltage and ESD protection network. Low-pass output filter for channel A and B signals reduce transition time to a useful level while generating least electromagnetic emissions. Connection is by a 4-wire, 1.27 mm flat ribbon cable with 6 or 10 pole insulation displacement connector as to EN 60603-13/DIN 41651.

Note

The listed data are for informational purposes only. None of the stated values or information may be used as an indicator of guaranteed performance.

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1 TECHNICAL DATA

1.1 Absolute Maximum Rating

Parameter	Conditions	Min.	Max.	Unit
Supply voltage (V_{CC})	Polarity protection by diode	-32	32	V
Supply current (I_{CC})	Control value without external load resistors	0	50	mA
Signal output current (I_{signal})	Output A and B	0	48	mA
ESD voltage (V_{esd}), all pins			>2	kV
Operation temperature (T_{amb})		-40	+100	°C
Storage temperature (T_{store})		-40	+105	°C
Humidity	Condensation not permitted	20	80	%rH

1.2 Electrical Data

Parameter	Conditions	Min.	Typ.	Max.	Unit
Supply voltage (V_{CC})	Typical values only	3	5	24	V
Supply current (I_{CC})	Load at outputs >10 kΩ	3	4	8	mA
HIGH Level Output Current (I_{OH})	V_{CC} - V_{OH} < 0.5 V			50	µA
LOW Level Output Current (I_{OL})		-24			mA
HIGH Level Output Voltage (V_{OH})	I_{OH} = 50 µA	V_{CC} - 0.5			V
LOW Level Output Voltage (V_{OL})	I_{OL} < 24 mA			0.6	V
Rise time LOW to HIGH (t_{LH}), Level Output 10…90%	$R_{pull-down}$ = 1 MΩ, C_L ≤ 100 pF, $R_{pull-up}$ = ∞		25		µs
Fall time HIGH to LOW (t_{HL}), Level Output 10…90%	$R_{pull-down}$ = 1 MΩ, C_L ≤ 100 pF, $R_{pull-up}$ = ∞		0.5	1	µs

1.3 Angle Measurement

➔*"Definitions" on page 6*

Parameter	Conditions	Min.	Typ.	Max.	Unit
Number of channels			2		–
Pulse frequency (f_{pulse})	Maximum output pulse frequency			>5	kHz
Resolution (N)	Impulses per turn		1		cpt
State length (L_{state})	n=5000 rpm, T=25°C	45	90	135	°el
Integral Nonlinearity (INL)	Maximum average angle error over one turn		5	45	°m
Differential Nonlinearity (DNL)	Maximum average state length error over one turn		0.1	1	LSB
Repeatability (Jitter)	n=5000 rpm, T=25°C		0.25	2	°m

1.4 Mechanical Data

Parameter	Conditions	Value	Unit
Dimensions (D x L)	without flange (➔Figure 3)	Ø10.0 x 9.0	mm
Moment of inertia (Jt)	Motor shaft Ø1…6 mm	0.01…0.09	g cm²
Standard cable length (Lc)		150	mm

Table 1 Technical Data

1.5 Diagram

The diagram shows the output circuitry of both channels (Ch A, Ch B).

At the load network, $R_{pull\text{-}up}$ must limit the current into pin 3/4 to 24 mA. $R_{pull\text{-}down}$ must be large with respect to the internal 10 kΩ pull-up resistor. Generally, either a high-impedance network (CMOS input or similar) or an external pull-up resistor is suggested.

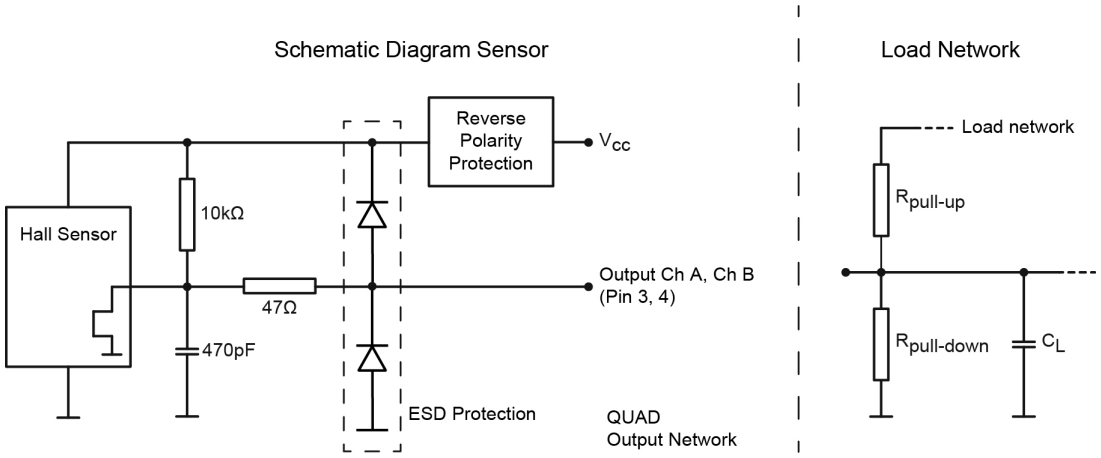


Figure 2 Output Circuitry

1.6 Dimensional Drawing

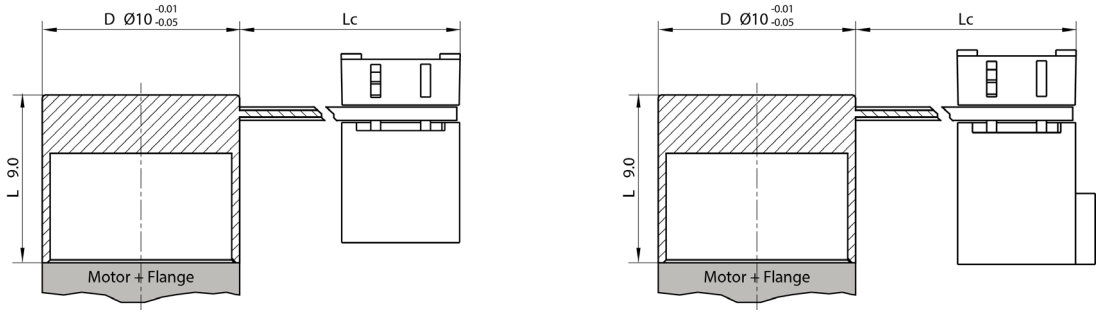


Figure 3 Dimensional Drawing [mm] – ENX 10 QUAD with 6pole IDC Connector (left) / with 10pole IDC Connector (right)

2 DEFINITIONS

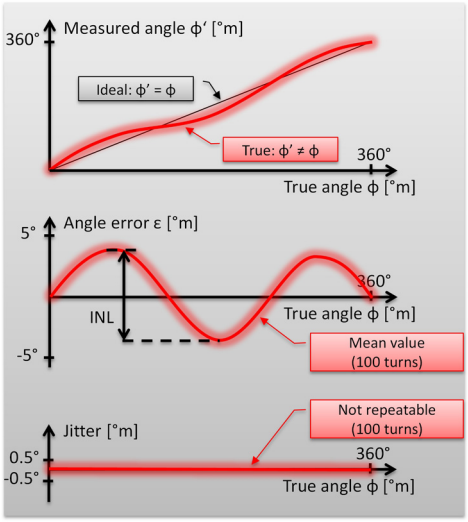
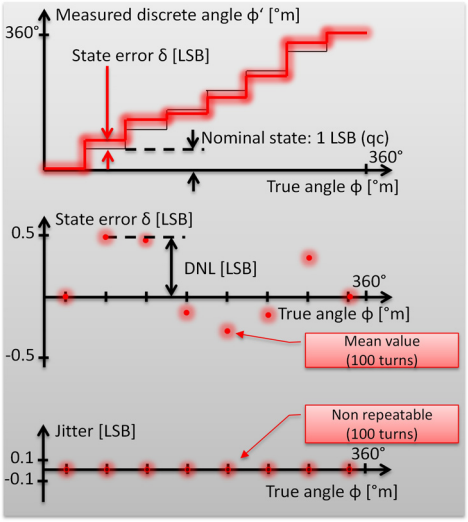
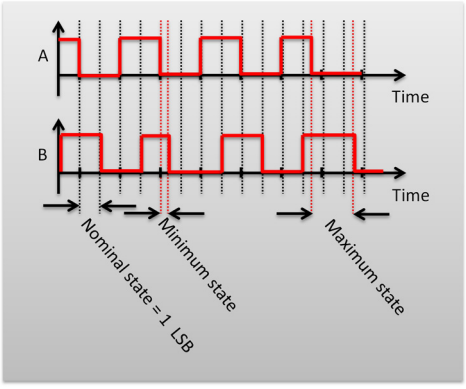
Metric	Definition	Illustration
Angle Error [°m]	Difference of measured and true angular shaft position at each position.	
Average Angle Error [°m]	Average of Angle Error over a number of turns.	
Integral Nonlinearity (INL) [°m]	Peak-to-peak value of Average Angle Error.	
Jitter (Repeatability) [°m] or [LSB]	Six standard deviations of Angle Error per turn (over one turn, at a given number of turns). **Jitter [°m]** is typically independent of resolution and defines the maximum useful positioning repeatability. **Jitter [LSB]** is resolution-dependent. At given Jitter [°m], the value is roughly proportional to resolution.	
Least Significant Bit (LSB)	Minimum measurable difference between two angle values at given resolution (= quadcount, = State).	
State Error [LSB]	Difference between actual state length and average state length.	
Average State Error [LSB]	Average of State Error over a number of turns for each state of a turn.	
Differential Nonlinearity [DNL]	Maximum positive or negative Average State Error.	
Minimum State Length [°el]	Minimum measured state length within a number of turns relative to pulse length.	
Maximum State Length [°el]	Maximum measured state length within a number of turns relative to pulse length.	
Minimum State Duration [ns]	By chip limited minimum time separation between two A/B transitions. Note: Not applicable to ENX 10 QUAD.	

Table 2 Definitions

3 TYPICAL MEASUREMENT RESULTS

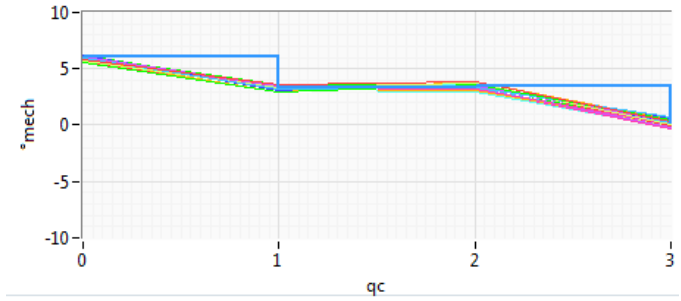
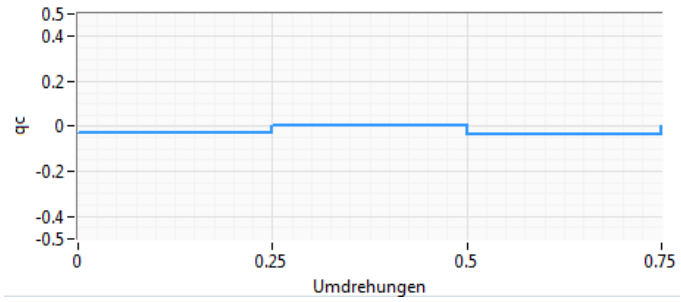
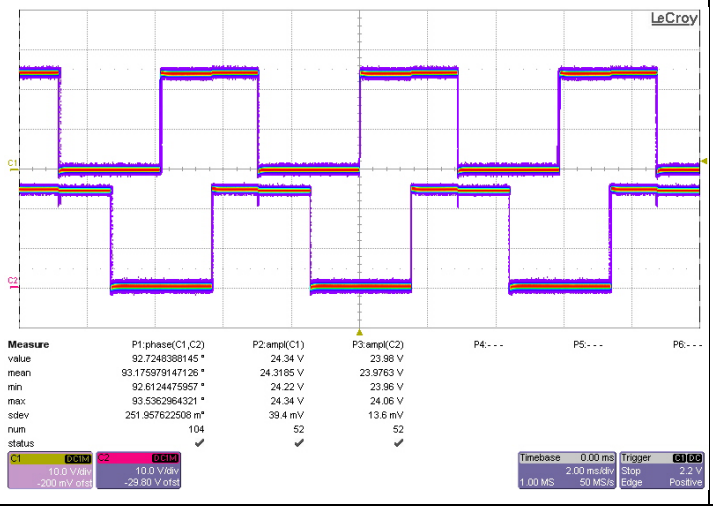
Parameter	Graph	Analysis
Angle Error per Turn		5000 rpm, 100 turns, 25°C: INL = 5.7°m
State Error per Turn		5000 rpm, 100 turns, 25°C: DNL = 0.04 LSB Min State = 0.96 LSB = 86°el Max State = 1.07 LSB = 96°el
Oscilloscope Trace at 15‘000 rpm		2 ms/div, 2 V/div, 25°C, 15‘000 rpm, C1 = Ch A, C2 = Ch B

Table 3 Typical Measurement Results

4 PIN ASSIGNMENT

Maximum permitted Supply Voltage
- *Make sure that supply power is within stated range.*
- *Supply voltages exceeding the stated range will destroy the unit.*
- *Connect the unit only when supply voltage is switched off (V_{CC}=0).*

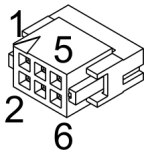


Figure 4 Cable Plug 6pole

Pin	Signal	Description
1	–	not connected
2	V_{CC}	Power supply voltage
3	Ch A	Channel A
4	Ch B	Channel B
5	GND	Ground
6	–	not connected

Table 4 Cable Plug 6pole – Pin Assignment

Specifications	
Connector	IDC socket, pitch 2.54 mm, 3 x 2 poles
Mating plug	Pin header, pitch 2.54 mm, 3 x 2 poles (EN 60603-13/DIN 41651)

Table 5 Cable Plug 6pole – Specifications

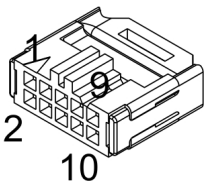


Figure 5 Cable Plug 10pole

Pin	Signal	Description
1	–	not connected
2	V_{CC}	Power supply voltage
3	Ch A	Channel A
4	Ch B	Channel B
5	GND	Ground
6	–	not connected
7	–	not connected
8	–	not connected
9	–	not connected
10	–	not connected

Table 6 Cable Plug 10pole – Pin Assignment

Specifications	
Connector	IDC socket, pitch 2.54 mm, 5 x 2 poles
Mating plug	Pin header, pitch 2.54 mm, 5 x 2 poles (EN 60603-13/DIN 41651)

Table 7 Cable Plug 10pole – Specifications

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