

LI Series Magnetic Encoder

Shaftless GMR incremental encoder for NEMA stepper motors

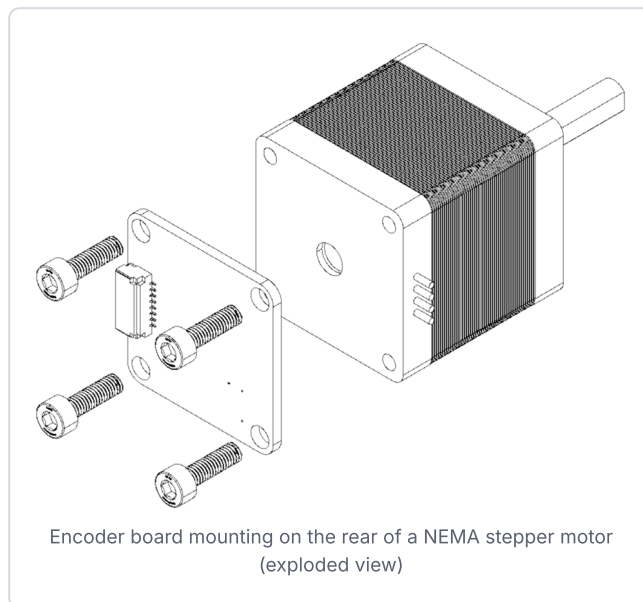
The Barronic Technologies **LI series** is a compact, PCB-form-factor magnetic rotary encoder that mounts directly on the rear of a NEMA stepper motor. An encoder magnet, supplied in the box, is fixed to the end of the motor shaft; the GMR (giant magnetoresistive) sensor on the encoder board reads the magnet's field without contact and produces quadrature incremental signals.

With no shaft, bearings or coupling of its own, the encoder adds almost no length to the motor and has no wearing parts. Outputs are RS422 differential line-driver signals (A, B and index), giving reliable transmission over long cable runs in electrically noisy machines.

Four resolutions from 512 to 4096 pulses per revolution and four board sizes for NEMA 11, 14, 17 and 23 motors are available, selected by part number.

Features and benefits

- ▶ **Non-contact GMR sensing:** no optical disc and no wearing parts
- ▶ **Shaftless design:** mounts behind the motor on the rear shaft extension, magnet included
- ▶ **4 resolutions:** 9, 10, 11 and 12 bit (512 / 1024 / 2048 / 4096 PPR)
- ▶ **RS422 differential outputs:** A+/A-, B+/B- quadrature and once-per-turn index
- ▶ **Speeds up to 9000 rpm**, angle error $\leq 1.0^\circ$ at 25 °C
- ▶ **Single +5 V $\pm 10\%$ supply**
- ▶ **ESD protection** to IEC 61000-4-2 Level 4
- ▶ **Direct fit** for NEMA 11, NEMA 14, NEMA 17 and NEMA 23 stepper motors



In the box: LI encoder board and encoder magnet.
Sold separately: connection cable.

For further information contact
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Industries



INDUSTRIAL
AUTOMATION



MOTOR CONTROL



MEDICAL



AGRICULTURE



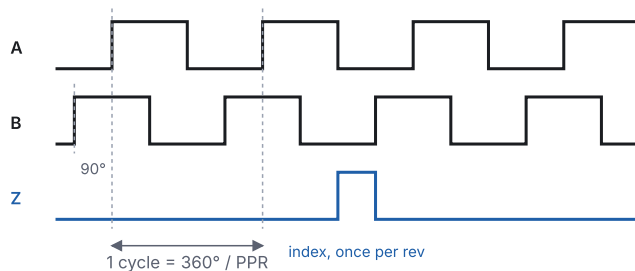
PACKING

Specifications

GENERAL		MECHANICAL	
Sensing principle	GMR, magnetic, non-contact	Form factor	PCB, mounts to rear motor face
Encoder type	Incremental, shaftless (PCB form factor)	Motor compatibility	NEMA 11, NEMA 14, NEMA 17, NEMA 23
Resolution	512, 1024, 2048, 4096 PPR (9, 10, 11, 12 bit)	Board size	Specific to each NEMA motor size
Maximum speed	9000 rpm	Connector	8-pin, 1 mm pitch
Angle error	≤ 1.0° at 25 °C ≤ 1.9° over -40 to +125 °C	Cable	Sold separately
ELECTRICAL		MAGNET AND INSTALLATION	
Supply voltage	+5 V DC ±10 %	Encoder magnet	Supplied in the box
Output type	RS422 differential line driver	Magnet-to-sensor air gap	approx. 0.5 mm
Output signals	A+, A-, B+, B-, C+, C- (C = index / Z)	Mounting	Behind the motor, on the rear shaft extension
Index	1 pulse per revolution		
ESD protection	IEC 61000-4-2, Level 4		

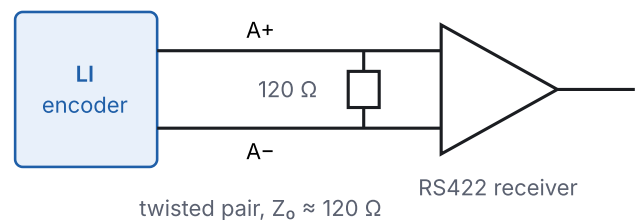
Output signals

Incremental timing (complementary signals not shown)



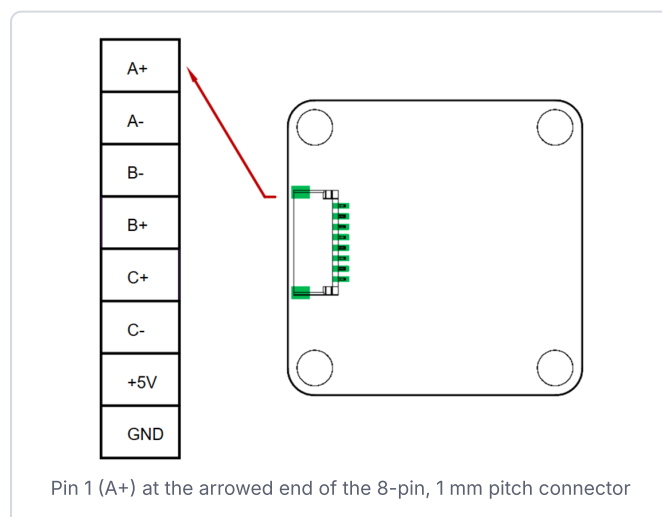
A and B are in quadrature (90° electrical apart). Each output is a differential pair, e.g. A+ and A-.

Recommended receiver



Terminate each pair (A, B, C) with 120 Ω at the receiver end. Use twisted-pair, shielded cable and connect the shield at the controller side.

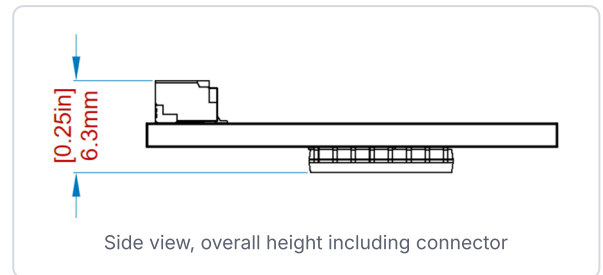
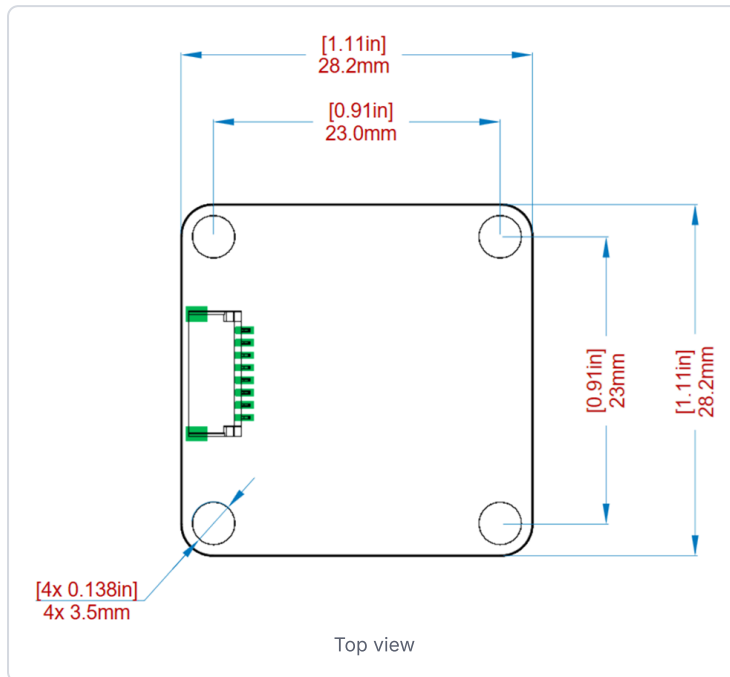
Connections



Pin	Signal	Description
1	A+	Channel A, non-inverted
2	A-	Channel A, inverted
3	B-	Channel B, inverted
4	B+	Channel B, non-inverted
5	C+	Index (Z), non-inverted
6	C-	Index (Z), inverted
7	+5V	Supply +5 V DC
8	GND	Supply ground (0 V)

Note the order of pins 3 and 4 (B- before B+).

Dimensions



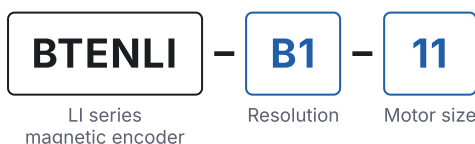
Dimensions in mm [inches]. Board size and mounting-hole pattern are specific to each NEMA motor size (11, 14, 17, 23).

Installation

1. Use a stepper motor with a rear shaft extension. Fix the supplied encoder magnet centrally to the end of the rear shaft.
2. Place the encoder board over the magnet with the sensor facing it, aligning the four holes with the motor's rear mounting holes.
3. Secure with four screws; the magnet-to-sensor air gap should be approx. 0.5 mm.
4. Connect the cable (sold separately) and power the encoder from a regulated +5 V $\pm 10\%$ supply.

Handling: the board is ESD protected to IEC 61000-4-2 Level 4, but handle it by the edges in an ESD-controlled area. Keep magnetic tools and stray fields away from the sensor and magnet.

Ordering information



Example: **BTENLI-B3-17** = 2048 PPR encoder for a NEMA 17 motor. Cable sold separately.

Code	Resolution	Code	Motor size
B1	512 PPR (9 bit)	11	NEMA 11
B2	1024 PPR (10 bit)	14	NEMA 14
B3	2048 PPR (11 bit)	17	NEMA 17
B4	4096 PPR (12 bit)	23	NEMA 23