

# L2 Motor Encoder

## L2 Features

- Kit version for mounting on a motor or other shaft
- Low profile, only 10.11mm tall
- Supports 14 shaft sizes (2 to 8 mm and 1/8 to 5/16 in.)
- For NEMA 17 to NEMA 34 and larger motors
- Resolutions from 32-1,250 CPR (128-5,000 PPR)
- 2 channel quadrature TTL square wave output
- Optional Index channel
- High retention connector/cable (sold separately)



## L2 Motor Encoder Description

The L2 motor encoder is a low-profile rotary encoder with a height of 10.11mm that mounts directly to a motor or other rotating shaft. This optical encoder features a rugged, glass-filled polymer housing and is designed for easy installation into space-limited applications. The L2 has a standard 19.05mm bolt spacing mount.



The L2 optical rotary encoder contains a precision machined aluminum hub with a specially patterned Mylar disk. This disk, in combination with our proprietary optical encoder module, creates a system that is highly tolerant to mechanical misalignment.

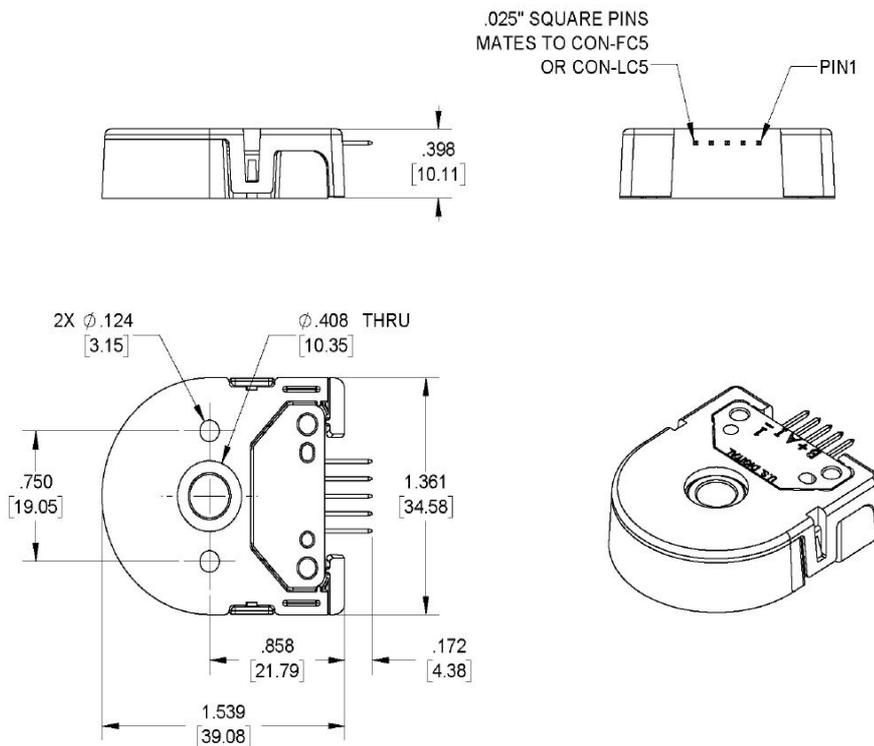
The L2 incremental encoder has a single-ended output and is designed for use with a high-retention connector/cable, which are sold separately.

## Mechanical Drawings

# L2 Motor Encoder

## L2 Motor Encoder (Default)

RELEASE DATE: 11/21/2025



UNITS: INCHES [MM]  
METRIC SHOWN FOR REFERENCE ONLY

## Specifications

### ENVIRONMENTAL

PARAMETER	VALUE	UNITS
Operating Temperature, CPR < 2000	-40 to 100	C
Operating Temperature, CPR ≥ 2000	-25 to 100	C
Electrostatic Discharge, IEC 61000-4-2	± 4	kV
Vibration (10Hz to 2kHz, sinusoidal)	20	G
Shock (6 milliseconds, half-sine)	75	G

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## MECHANICAL

PARAMETER	VALUE	UNITS
Max. Shaft Axial Play	±0.010	in.
Max. Shaft Runout	0.004 T.I.R.	in.
Max. Acceleration	250000	rad/sec <sup>2</sup>
For CPR ≤ 1250: Max. RPM (1) Max. A/B Frequency e.x. CPR=1250, Max. RPM=14400 e.x. CPR=100, Max. RPM=60000	minimum value of $((18 \times 10^6) / \text{CPR})$ and (60000) 300	RPM kHz
Typical Product Weight	0.53	oz.
Codewheel Moment of Inertia	$8.0 \times 10^{-6}$	oz-in-s <sup>2</sup>
Hub Set Screw	#4-48	
Hex Wrench Size	0.050	in.
Mounting Screw Size	#2-56 or #4-40	
Required Shaft Length (2)(3)	0.445 to 0.575	in.
Index Alignment to Hub Set Screw	180 Typical	degrees
Technical Bulletin TB1001 - Shaft and Bore Tolerances		

(1) 60000 RPM is the maximum rpm due to mechanical considerations. The maximum rpm due to the module's maximum frequency response is dependent upon the module's resolution (CPR).

(2) Add 0.125" to the required shaft length when using R-option.

(3) Including Axial play.

## TORQUE SPECIFICATIONS

PARAMETER	VALUE	TORQUE
Hub Set Screw	2-3	in-lbs
Base Mounting Screw (#4-40)	4-6	in-lbs

## PHASE RELATIONSHIP

A leads B for clockwise shaft rotation, and B leads A for counterclockwise rotation viewed from the cover side of the encoder.

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## ELECTRICAL

- Specifications apply over the entire operating temperature range.
- Typical values are specified at  $V_{cc} = 5.0V_{dc}$  and  $25^{\circ}C$ .
- For complete details, see the EM1 or EM2 product pages.

PARAMETER	MIN.	TYP.	MAX.	UNITS	CONDITIONS
Supply Voltage	4.5	5.0	5.5	V	
Supply Current		27	33	mA	CPR < 500, no load
		54	62	mA	CPR $\geq$ 500 and < 2000, no load
		72	85	mA	CPR $\geq$ 2000, no load
Low-level Output			0.5	V	$I_{OL} = 8mA$ max., CPR < 2000
			0.5	V	$I_{OL} = 5mA$ max., CPR $\geq$ 2000
		0.25		V	no load, CPR $\geq$ 2000
High-level Output	2.0			V	$I_{OH} = -8mA$ max. and CPR < 2000
	2.0			V	$I_{OH} = -5mA$ max. and CPR $\geq$ 2000
	4.8			V	no load and CPR < 2000
	3.5			V	no load and CPR $\geq$ 2000
Output Current Per Channel	-8		8	mA	CPR < 2000
	-5		5	mA	CPR $\geq$ 2000
Output Rise Time		110		nS	CPR < 2000
		50		nS	CPR $\geq$ 2000, $\pm 5mA$ load
Output Fall Time		100		nS	CPR < 2000
		50		nS	CPR $\geq$ 2000, $\pm 5mA$ load

# L2 Motor Encoder

## PIN-OUT

PIN	DESCRIPTION
1	Ground
2	Index
3	A channel
4	+5VDC power
5	B channel

**Note:** 5-pin single-ended mating connector is CON-C5 or CON-LC5

## MOTOR ASSEMBLY CONFIGURATION

The effect of increasing performance through more length is particularly evident in short engines. Only a few millimeters will have a significant effect. Taking the Angst+Pfister 60mm BLDC motor series APBL60-24 and compare the E2-series (17.85mm) to L2-series (10.11mm) will gain 7mm for the motors size which leads to a significant higher available rated torque/or rated power.

Product table:

Model		APBL60-24-032-068	APBL60-24-042-075	APBL60-24-060-088
Number of phase		3		
Number of pole		8		
Voltage	Vdc	24VDC (Option for 12VDC, 36VDC, 48VDC)		
No load speed	rpm	4000	4000	4000
Rated torque	Nm	0.32	0.42	0.6
Rated Speed	rpm	3000	3000	3000
Rated Current	A	5.5	7.1	10
Rated Power	W	100	133	188
Weight	kg	0.9	1	1.2
Length	mm	68	75	88

# L2 Motor Encoder

## ACCESSORIES

### 1. Centering Tool

**Part #: CTOOL - (Shaft Diameter)**

This reusable tool centers the shaft within the encoder base during assembly. It must be used for the proper functioning of the encoder.

### 2. Hex Tool

**Part #: HEXD-050**

Hex driver, 0.050" flat-to-flat for #3-48 or #4-48 set screws. Included with **-B** or **-1** packaging options for order quantities of 10 or more.

**Part #: HEXW-050**

Hex wrench, 0.050" flat-to-flat for #3-48 or #4-48 set screws. Included with **-B** or **-1** packaging options for order quantities of 9 or less.

Included with **-3** packaging option for all order quantities.

### 3. Spacer Tool

**Part #: SPACER-L2**

This reusable tool sets the correct spacing between the disk and sensor during assembly. It must be used for the proper functioning of the encoder.

### 4. Screws

**Part #: SCREW-256-250-PH**

Description: Pan Head, Phillips #2-56 UNC x 1/4"

Use: Base Mounting

Quantity Required: 2

Screws are not included

**Part #: SCREW-440-188-PH**

Description: Pan Head, Phillips 4-40 UNC x 3/16"

Use: Base Mounting

Quantity Required: 2

Screws are not included

**Part #: SCREW-440-250-PH**

Description: Pan Head, Phillips #4-40 UNC x 1/4"

Use: Base Mounting

Quantity Required: 2

Screws are not included

**Part #: SCREW-448-063-SS**

Description: Socket Head Set Screw, 4-48 UNC x 1/16"

Use: Hub/Disk Mounting for 5/16" - 10mm Bore

Quantity Required: 1

Screw is included

**Part #: SCREW-448-125-SS**

Description: Socket Head Set Screw, 4-48 UNC x 1/8"

Use: Hub/Disk Mounting for 2mm - 1/4" Bore

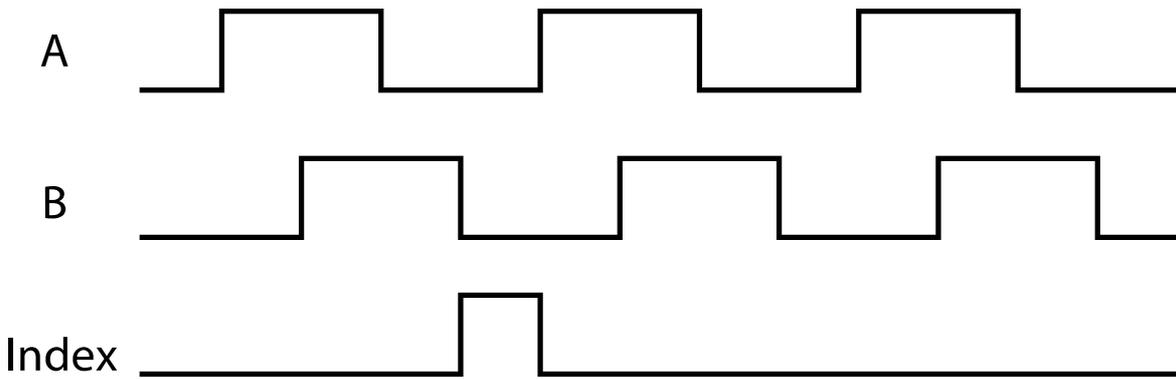
Quantity Required: 1

Screw is included

# L2 Motor Encoder

## OUTPUT WAVEFORMS

### SINGLE-ENDED



## Notes

- Cables and connectors are not included and must be ordered separately.

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## Configuration Options

L2	CPR (Cycles Per Revolution)	Bore Size	Index	Cover	Base	Packaging
		079 (2.0mm)	IE ( <i>Index</i> )	D ( <i>Default</i> )	D ( <i>Default</i> )	Bulk (B) - Includes one centering, hex and spacer tool per order, plus an extra set per 100 encoders.
	32	118 (3.0mm)	NE ( <i>Non-Index</i> )			
	50	125 (1/8")				
	96	156 (5/32")				Individual (1) - Includes one centering, hex, and spacer tool per order, plus an extra set per 100 encoders.
	100	157 (4.0mm)				
	120	188 (3/16")				
	192	197 (5.0mm)				Individual (2) - Includes one centering, hex, and spacer tool with each encoder.
	200	236 (6.0mm)				
	250	250 (1/4")				
	256	276 (7.0mm)				
	360	313 (5/16")				
	400	315 (8.0mm)				
	500					
	512					
	540					
	720					
	800					
	900					
	1000					
	1024					
	1250					

**PLEASE NOTE: This chart is for informational use only.** Certain product configuration combinations are not available. Visit the L2 product page (<https://www.usdigital.com/products/L2>) for pricing and additional information.