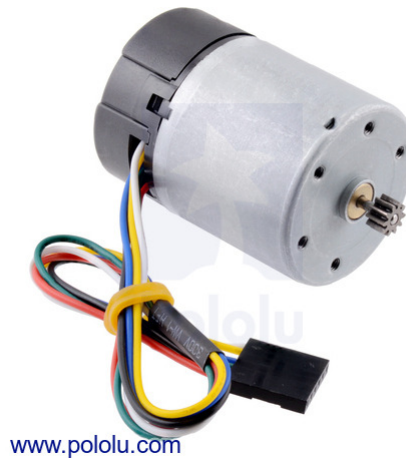# 12V Motor with 64 CPR Encoder for 37D mm Metal Gearmotors (No Gearbox, Spur Pinion)

Pololu item #: 2821
Brand: Pololu
Status: Special Order Only ❓

✔ RoHS 3

This product has been discontinued.

This motor has been replaced by a **functionally identical version** that works with our newer 37D gearmotors with helical pinion gears. It is now only available by large-volume special order; please **contact us** for more information.

This is the motor and encoder portion of our 37D mm metal gearmotors with 64 CPR encoders. It does not include a gearbox, but the pinion gear on the output shaft works with all of our **spur pinion** 37D mm gearmotor gearboxes, so this can be used as a replacement motor or encoder for those gearboxes. It is intended for use at 12 V, though the motor can begin rotating at voltages as low as 1 V.

Key specifications:

voltage	no-load performance	stall extrapolation
12 V	10,000 RPM, 200 mA	0.5 kg·cm (7 oz·in), 5.5 A

Overview

This motor with integrated 64 CPR (counts per revolution) quadrature encoder is intended as a replacement motor and encoder for our **37D mm metal gearmotors** with spur pinion gears (**note:** we have a version of this gearmotor available **with a helical pinion gear** that works with our newer helical pinion 37D gearmotors). The 2mm output shaft has a non-removable pinion gear that works with all of our "Spur Pinion" 37D mm gearmotor gearboxes. Note that we do not sell the 37D mm gearboxes separately, but if you have a gearmotor with a damaged motor or encoder (or if you want to effectively add an encoder to a version without an encoder), you can transfer the gearbox to this replacement motor.

The motor has a diameter of 34.5 mm (1.36 in) and a length of approximately 44 mm (1.7 in) from the top of the motor can to the bottom of the encoder. The top of the motor has six mounting holes evenly spaced around the outer edge threaded for M2.5 screws. These mounting holes form a regular hexagon, with the center of each hole located 13 mm from the center of the output shaft.. The mounting holes have a depth of approximately 3.5 mm. See our **37D gearmotor dimension diagrams** (461k pdf) for more details.

Pinion Gear Specs

- Metric with module m = 0.5

- Number of teeth: 10

- Face thickness: 4 mm

- Pressure angle: 20°

- Gear position: 9 mm from top of motor to top of gear

As of 24 December 2018, we have switched to using a more durable, alloy steel pinion

gear with this motor. Units shipped before this date had copper pinion gears.

Gearmotor Options

You will typically want to combine this motor with a gearbox to give it a more appropriate combination of torque and speed (without a gearbox, it offers very high speed with very low torque). Our 37D mm line of metal gearmotors consist of this motor combined with different gearboxes. We do not carry the gearboxes by themselves, so unless you are looking at this as a replacement motor for a compatible gearbox you already have, we strongly recommend you consider getting a preassembled gearmotor with the gear ratio that best suits your project requirements.

| Rated Voltage | Stall Current | No-Load Current | Gear Ratio | No-Load Speed (RPM) | Extrapolated Stall Torque | | Max Power (W) | Without Encoder | With Encoder |
					(kg · cm)	(oz · in)			
12 V	5.5 A	0.2 A	1:1 (no gearbox)	10,000	0.5	7	–	–	item #2821
			19:1	530	8.5	120	12	item #1102	item #2822
			30:1	330	14	190	12	item #1103	item #2823
			50:1	200	21	290	10	item #1104	item #2824
			70:1	150	27	380	10	item #1105	item #2825
			100:1	100	34	470	8	item #1106	item #2826
			131:1	76	45	630	6	item #1107	item #2827

Note: Stalling or overloading gearmotors can greatly decrease their lifetimes and even result in immediate damage. In order to avoid damaging the gearbox, we recommend keeping continuously applied loads under 10 kg-cm (150 oz-in), and the recommended upper limit for instantaneous torque is 25 kg-cm (350 oz-in). Stalls can also result in rapid (potentially on the order of seconds) thermal damage to the motor windings and brushes; a general recommendation for brushed DC motor operation is 25% or less of the stall current.

This motor is intended for use at 12 V, though in general, these kinds of motors can run at voltages above and below the nominal voltage (this motor can begin rotating at voltages as low as 1 V).

Lower voltages might not be practical, and higher voltages could start negatively affecting the life of the motor.

This motor is functionally identical to the previous version we carried **without end caps** (it is the same motor and encoder). The black plastic end cap is easily removable if you need to access the encoder or want to slightly reduce the overall motor size, but there is a little bit of base plastic that will remain, as can be seen in the pictures below that show this motor combined with a gearbox:
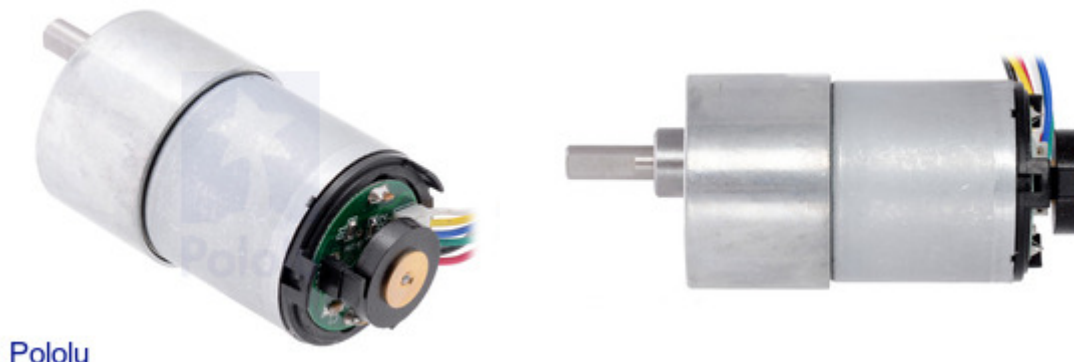
Using the Encoder

A two-channel Hall effect encoder is used to sense the rotation of a magnetic disk on a rear protrusion of the motor shaft. The quadrature encoder provides a resolution of 64 counts per revolution of the motor shaft when counting both edges of both channels. To compute the counts per revolution of the gearbox output, multiply the gear ratio by 64. The motor/encoder has six color-coded, 8″ (20 cm) leads terminated by a 1×6 female header with a 0.1″ pitch, as shown in the main product picture. This header works with standard **0.1″ male headers** and our male **jumper** and **precrimped wires**. If this header is not convenient for your application, you can pull the crimped wires out of the header or cut the header off. The following table describes the wire functions:

37D mm metal gearmotor with 64 CPR encoder (with end cap removed).

| Color	Function
Red	motor power (connects to one motor terminal)
Black	motor power (connects to the other motor terminal)
Green	encoder GND
Blue	encoder Vcc (3.5 – 20 V)

Yellow	encoder A output
White	encoder B output

The Hall sensor requires an input voltage, Vcc, between 3.5 and 20 V and draws a maximum of 10 mA. The A and B outputs are square waves from 0 V to Vcc approximately 90° out of phase. The frequency of the transitions tells you the speed of the motor, and the order of the transitions tells you the direction. The following oscilloscope capture shows the A and B (yellow and white) encoder outputs using a motor voltage of 12 V and a Hall sensor Vcc of 5 V:
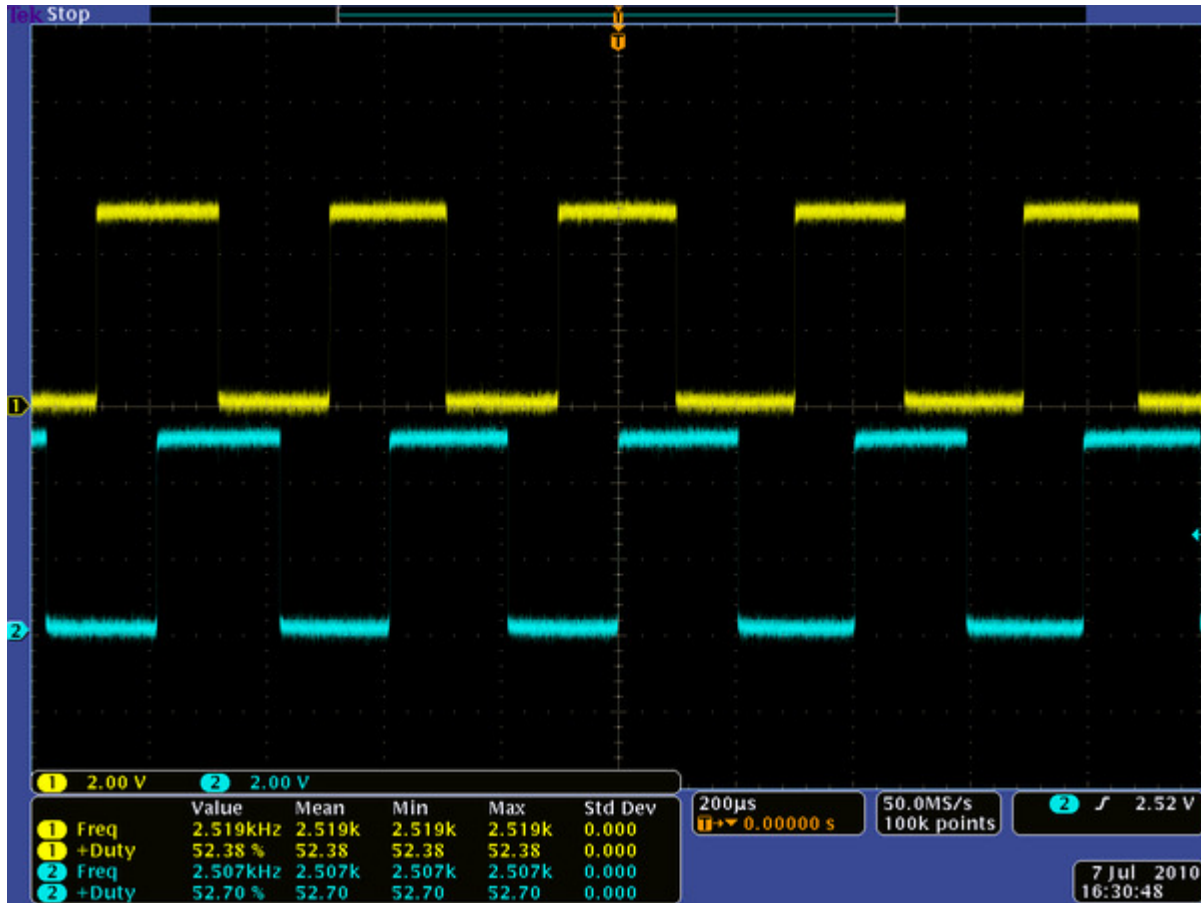
Encoder A and B outputs for 37D mm metal gearmotor with 64 CPR encoder (12V motor running at 12 V).

By counting both the rising and falling edges of both the A and B outputs, it is possible to get 64 counts per revolution of the motor shaft. Using just a single edge of one channel results in 16 counts per revolution of the motor shaft, so the frequency of the A output in the above oscilloscope capture is 16 times the motor rotation frequency.

Selecting the Right Gearmotor

We offer a wide selection of metal gearmotors that offer different combinations of speed and torque. Our **metal gearmotor comparison table** can help you find the motor that best meets your project's

requirements.

www.pololu.com

People often buy this product together with:

[Pololu Stamped Aluminum L-Bracket Pair for 37D mm Metal Gearmotors](#)