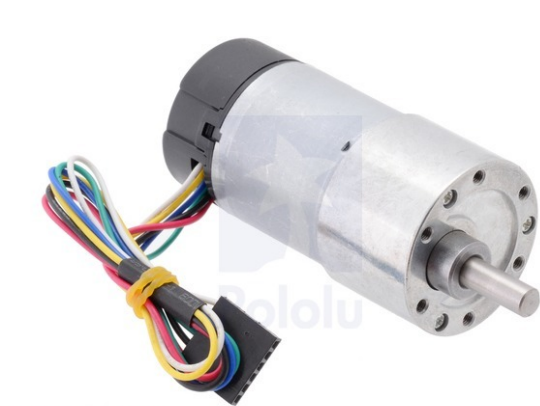# 131:1 Metal Gearmotor 37Dx73L mm 12V with 64 CPR Encoder (Spur Pinion)

Pololu item #: 2827
Brand: [Pololu](#)
Status: Obsolete ⍰

✓ **RoHS 3**

This product has been discontinued.

This gearmotor has been replaced by a **[functionally identical version](#)** that uses helical pinion gears for the first stage of the gearbox to reduce noise and improve efficiency.

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◀ ▶

This gearmotor is a powerful 12V brushed DC motor with a **131.25:1** metal gearbox and an integrated quadrature encoder that provides a resolution of 64 counts per revolution of the motor shaft, which corresponds to **8400 counts per revolution** of the gearbox's output shaft. These units have a 16 mm-long, 6 mm-diameter D-shaped output shaft. This gearmotor is also available **[without an encoder](#)**.

Key specifications:

voltage	no-load performance	stall extrapolation
12 V	76 RPM, 200 mA	45 kg·cm (630 oz·in), 5.5 A

Alternatives available with variations in these parameter(s): gear ratio   encoders? **Select variant…**

Description   **Specs (21)**   **Pictures (14)**   **Resources (4)**   **FAQs (1)**   **On the blog (1)**

Overview

> **Newer versions available:** Our original 37D gearmotors with spur pinion gears have been replaced by **[newer versions](#)** that feature helical gears for the first stage of the gearbox, which makes the gearbox a little quieter and more efficient. The performance is otherwise unchanged, and the dimensions are the same, so the new versions with helical pinion gears can be used as direct replacements for the original units. The pictures below of the motor portion with the gearbox removed show the two pinion gear types:

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

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

This powerful brushed DC gearmotor is available in a variety of different gear ratios and features an integrated quadrature encoder with 64 counts per revolution (CPR) of the motor shaft. The **motor and encoder portion** is available by itself (no gearbox), and versions without the encoder are also available.

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.

These motors are intended for use at 12 V, though in general, these kinds of motors can run at voltages above and below the nominal voltage (they 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.

These gearmotors are functionally identical to the previous versions we carried **without end caps** (they use the same motor, encoder, and gearboxes). The black plastic end cap is easily removable if you need to access the encoder or want to slightly reduce the overall gearmotor size, but there is a little bit of base plastic that will remain, as shown in the pictures below:
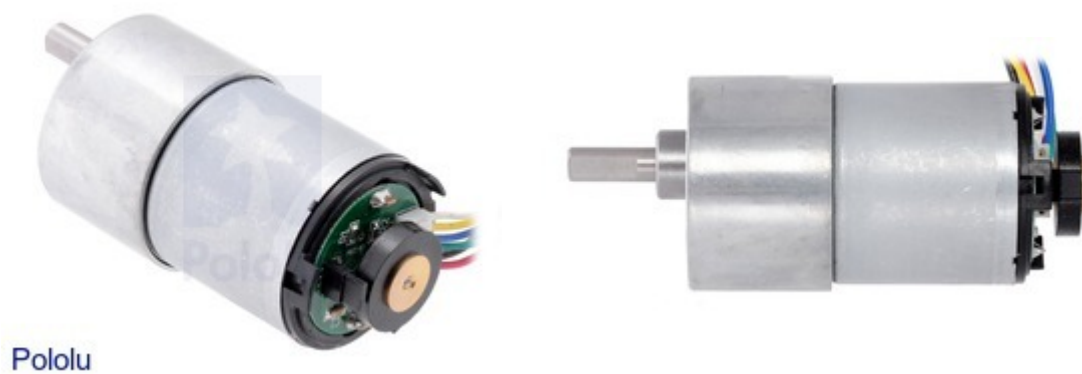
Details for item #2827

Exact gear ratio: $\dfrac{25 \times 30 \times 30 \times 28 \times 30}{10 \times 10 \times 10 \times 12 \times 12} = \mathbf{131.25 : 1}$

Dimensions
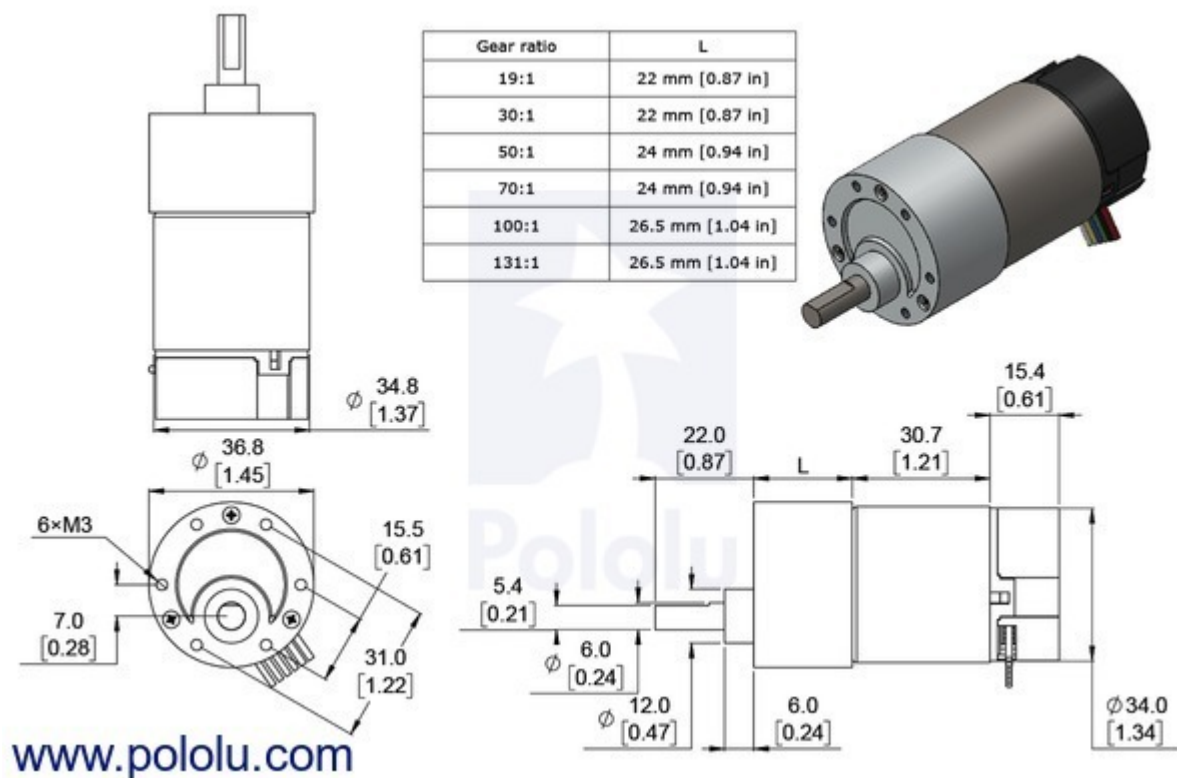
Dimensions of the 37D mm metal gearmotor with 64 CPR encoder. Units are mm over [inches].

Gear ratio	L
19:1	22 mm [0.87 in]
30:1	22 mm [0.87 in]
50:1	24 mm [0.94 in]
70:1	24 mm [0.94 in]
100:1	26.5 mm [1.04 in]
131:1	26.5 mm [1.04 in]

This diagram is also available as a **downloadable PDF** (461k pdf).

> **Warning**: Do not screw too far into the mounting holes as the screws can hit the gears. We recommend screwing no further than 3mm (1/8″) into the screw hole.

Using the Encoder

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

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:

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.

Gearmotor accessories

The face plate has six mounting holes evenly spaced around the outer edge threaded for M3 screws. These mounting holes form a regular hexagon and the centers of neighboring holes are 15.5 mm apart. We carry two brackets for these gearmotors: a **stamped aluminum L-bracket** (sold in pairs) and a sturdier, tombstone-style **machined aluminum bracket** (sold individually):

37D mm gearmotor (without encoder) with L-bracket and 6mm universal mounting hub.

Pololu machined aluminum bracket for 37D mm metal gearmotors mounting a motor to a clear piece of acrylic.

The 6 mm diameter gearbox output shaft works with the **Pololu universal aluminum mounting hub for 6mm shafts**, which can be used to mount our larger **Pololu wheels** (80mm- and 90mm-diameter) or custom wheels and mechanisms to the gearmotor's output shaft as shown in the left picture below. Alternatively, you could use our **6mm scooter wheel adapter** to mount many common scooter, skateboard, and inline skate wheels to the gearmotor's output shaft as shown in the right picture below:

37D mm metal gearmotor with 64 CPR encoder connected to a Pololu 90×10mm wheel with a Pololu universal mounting hub.


A 37D mm gearmotor connected to a scooter wheel by the 6 mm scooter wheel adapter.

For a general-purpose hex adapter, consider our **12mm hex wheel adapter** (also available in an **extended version**), which lets you use these motors with many common hobby RC wheels, including **Dagu Wild Thumper Wheels**:

12mm Hex Wheel Adapter for 6mm Shaft connecting a Wild Thumper Wheel to a 37D mm Metal Gearmotor.

We have a number of **motor drivers** and **motor controllers** that work with these 37D mm metal gearmotors. We generally recommend our **High-Power Motor Drivers**, which are available in various power levels and versions, including some **dual-channel shields for Arduino** and **dual-channel expansion boards for Raspberry Pi**. Additionally, our VNH5019-based motor drivers, which are also available as **single** and **dual carriers**, are a good match for these gearmotors.
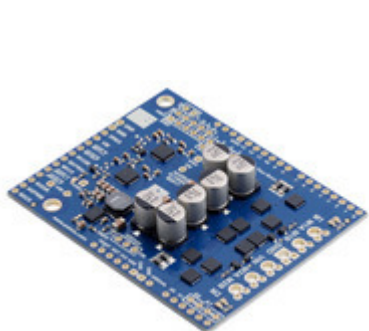
**Pololu Dual G2 High-Power Motor Driver 24v14 Shield for Arduino.**
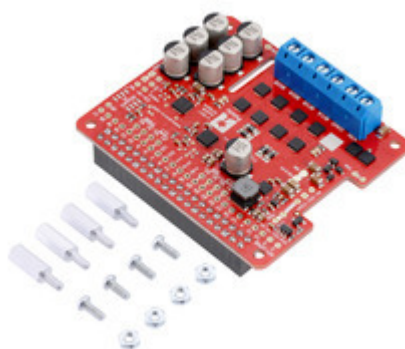
Pololu Dual G2 High-Power Motor Driver 24v14 for Raspberry Pi (assembled version) with included hardware.

Pololu dual VNH5019 motor driver shield for Arduino.

If you are looking for higher-level control interfaces, such as USB, RC, analog voltages, I²C, or TTL serial, consider our **Simple Motor Controllers**, **Jrk motor controllers**, or **RoboClaw motor controllers**; these controllers are available in various power levels several of which can handle these 37D mm metal gearmotors (we generally recommend a motor controller that can handle continuous currents above the stall current of your motor).
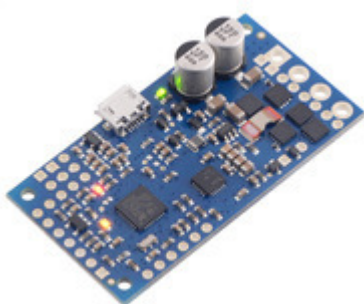
High-Power Simple Motor Controller G2 18v15.

Jrk G2 21v3 USB Motor Controller with Feedback.

RoboClaw 2×7A Motor

We have an assortment of Hall effect-based **current sensors** to choose from for those who need to monitor motor current:

ACS711EX current sensor carrier -15.5A to +15.5A.

ACS714 current sensor carrier -5A to +5A.

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.

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People often buy this product together with:

Pololu Stamped Aluminum L-Bracket Pair for

Pololu Universal Aluminum Mounting Hub for