





Gearmotor Options

This brushed DC gearmotor is available in high- and low-power versions in a number of gear ratios. The motor and encoder portions are available by themselves (i.e. without the gearbox), and many other gear ratios are also available without an encoder.

Gear Ratio	No-Load Speed @ 6 V	Stall Torque @ 6 V	Stall Current @ 6 V	 www.pololu.com	 www.pololu.com
				With Encoder	Without Encoder
1:1	9800 RPM	2 oz-in	6 A	motor without gearbox	
	5600 RPM	1 oz-in	2.2 A	motor without gearbox	
4.4:1	2220 RPM	8 oz-in	6 A		25Dx48L mm HP
	1280 RPM	5 oz-in	2.2 A		25Dx48L mm
9.7:1	1010 RPM	17 oz-in	6 A	25Dx48L mm HP	25Dx48L mm HP
	580 RPM	11 oz-in	2.2 A	25Dx48L mm	25Dx48L mm
20.4:1	480 RPM	36 oz-in	6 A		25Dx50L mm HP
	275 RPM	24 oz-in	2.2 A		25Dx50L mm
34:1	285 RPM	60 oz-in	6 A	25Dx52L mm HP	25Dx52L mm HP
	165 RPM	40 oz-in	2.2 A	25Dx52L mm	25Dx52L mm
47:1	210 RPM	80 oz-in	6 A	25Dx52L mm HP	25Dx52L mm HP
	120 RPM	50 oz-in	2.2 A	25Dx52L mm	25Dx52L mm
75:1	130 RPM	130 oz-in	6 A	25Dx54L mm HP	25Dx54L mm HP
	75 RPM	85 oz-in	2.2 A	 25Dx54L mm	25Dx54L mm
99:1	100 RPM	160 oz-in	6 A		25Dx54L mm HP
	57 RPM	110 oz-in	2.2 A		25Dx54L mm
172:1	57 RPM	260 oz-in	6 A		25Dx56L mm HP
	33 RPM	170 oz-in	2.2 A	 25Dx56L mm	25Dx56L mm
227:1	25 RPM	220 oz-in	2.2 A		25Dx56L mm
378:1	15 RPM	250 oz-in	2.2 A		25Dx58L mm
499:1	12 RPM	300 oz-in	2.2 A		25Dx58L mm

Note: At some of the higher gear ratios, these motors can generate enough torque to damage themselves. Any torque greater than about 250 oz-in (18 kg-cm) is likely to damage the gearbox, so we recommend that you avoid stalling the [172:1 HP](#), [227:1,378:1](#), and [499:1](#) versions of these motors at 6 V.

These motors are intended for use at 6 V. In general, these kinds of motors can run at voltages above and below this nominal voltage, so they should comfortably operate in the 3 – 9 V range, though they can begin rotating at voltages as low as 1 V. Higher voltages could start negatively affecting the life of the motor.

Gearmotor Dimensions

These gearmotors have output shafts with a diameter of 4 mm. The [Pololu universal aluminum mounting hub for 4mm shafts](#) can be used to mount our larger [Pololu wheels](#) (60mm-, 70mm-, 80mm-, and 90mm-diameter) or custom wheels and mechanisms to the gearmotor's output shaft (see the left picture below). These are the same type of motors used in the [Wild Thumper all-terrain chassis](#), and the gearbox's output shaft works directly with the 120mm-diameter [Wild Thumper wheels](#).



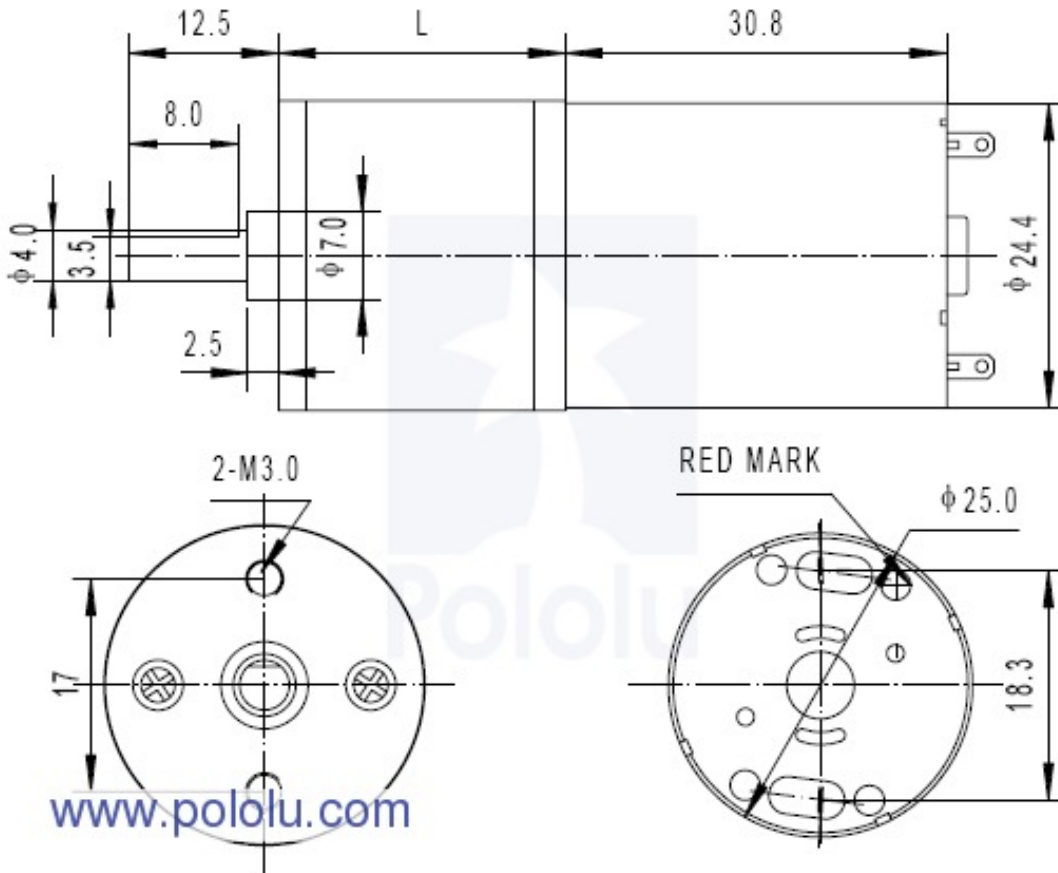
25D mm metal gear motor with 48 CPR encoder and Pololu 60×8mm wheel.

The face plate has two mounting holes threaded for M3 screws. You can use our custom-designed [25D mm metal gearmotor bracket](#) (shown in the picture below) to mount the gearmotor to your project via these mounting holes and the screws that come with the bracket.



Pololu 25D mm gearmotor with bracket.

The diagram below shows the dimensions (in mm) of the 25D mm line of gearmotors. The value of L is shown in the table below.



Gear Ratio	L (mm)
4.4:1	17
9.7:1	19
20.4:1	21
34.1	23
47:1	25
75:1	27
99:1	
172:1	
227:1	
378:1	
499:1	

Dimension diagram (in mm) for the 25D mm metal gearmotors.

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 48 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 48. The motor/encoder has six color-coded, 11" (28 cm) leads terminated by a 1x6 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:

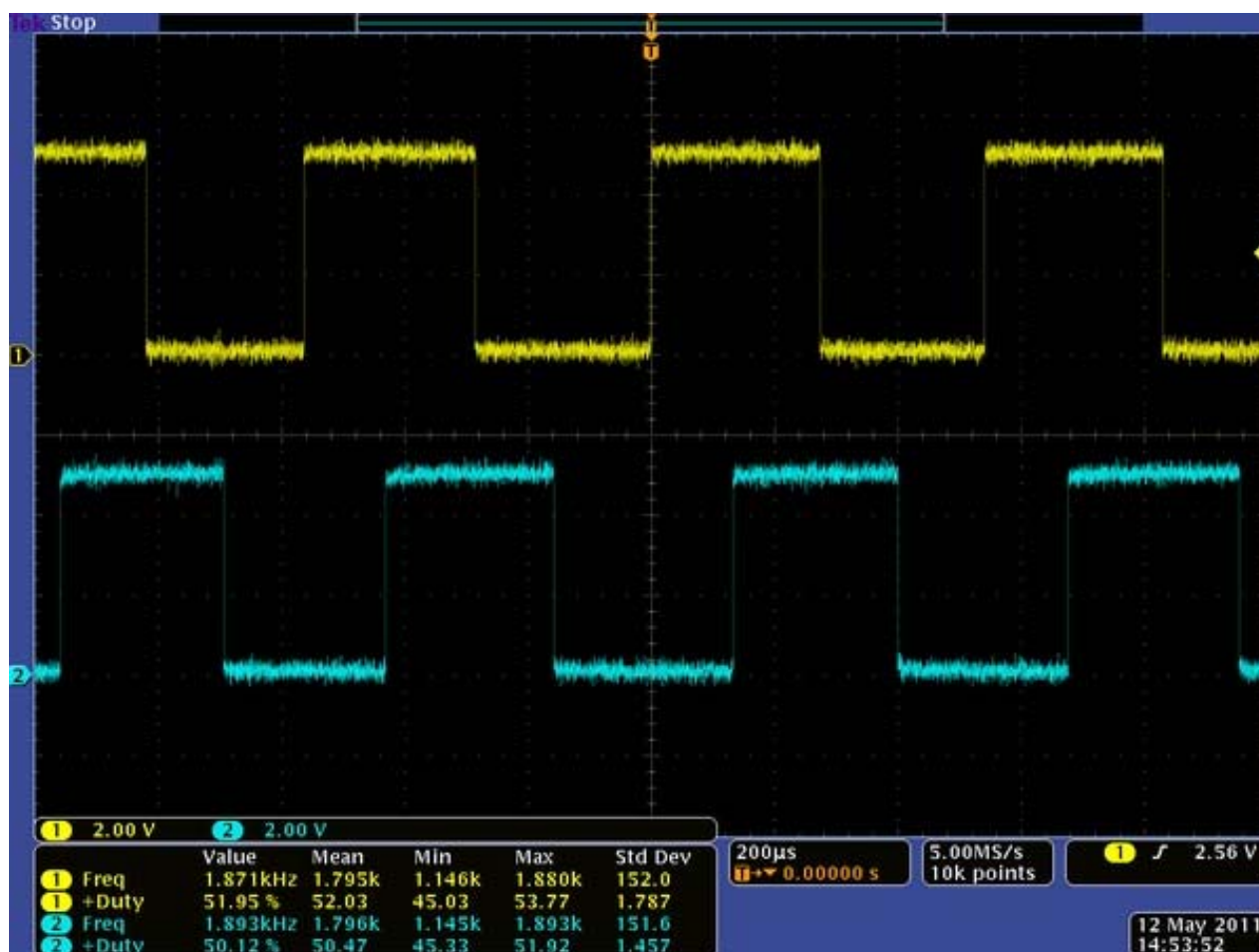


25D mm metal gearmotor with 48 CPR encoder: close-up view of encoder.

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 6 V and a Hall sensor Vcc of 5 V:



Encoder A and B outputs for 25D mm HP metal gearmotor with 48 CPR encoder (motor running at 6 V).

By counting both the rising and falling edges of both the A and B outputs, it is possible to get 48 counts per revolution of the motor shaft. Using just a single edge of one channel results in 12 counts per revolution of the motor shaft, so the frequency of the A output in the above oscilloscope capture

is 12 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.