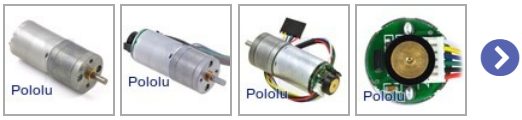
20.4:1 Metal Gearmotor 25Dx50L mm HP 6V



Pololu item #: 1572 **42** in stock

Price break	Unit price (US$)
1	21.95
10	19.76

Quantity: 1 Add to cart

backorders *allowed* Add to wish list

This gearmotor consists of a **high-power, 6 V** brushed DC motor combined with a **20.4:1** metal spur gearbox. The gearmotor is cylindrical, with a diameter just under 25 mm, and the D-shaped output shaft is 4 mm in diameter and extends 12.5 mm from the face plate of the gearbox.

Key specs at 6 V: 460 RPM and 550 mA (max) free-run, 75 oz-in (5.5 kg-cm) and 6.5 A stall.

You can use the following selection boxes to choose from all of our 25D metal gearmotor versions:

Select options: 20.4 :1 | 6.5A stall @ 6V (HP 6V) | encoders? N | Go ▶

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Description | **Specs (10)** | **Pictures (12)** | **Resources (4)** | **FAQs (2)** | **On the blog (1)**

Overview

These cylindrical brushed DC gearmotors are available in a wide range of gear ratios and with five different motors (two power levels of 6V motors and three power levels of 12V motors). The gearmotors all have the same 25 mm diameter case and 4 mm diameter gearbox output shaft, so it is generally easy to swap one version for another if your design requirements change (though the length of the gearbox tends to increase with the gear ratio). All versions are also available with an integrated 48 CPR quadrature encoder on the motor shaft. Please see the **25D metal gearmotor comparison table** for detailed specifications of all our 25D metal gearmotors. This dynamically-sortable table can help you find the gearmotor that offers the best blend of speed, torque, and current-draw for your particular application. A more basic comparison table is available below:

Rated Voltage	Motor Type	Stall Current @ Rated Voltage	No-Load Speed @ Rated Voltage	Approximate Stall Torque @ Rated Voltage	 With Encoder	 Without Encoder
6 V	high-power **(HP)**	6.5 A	10,000 RPM	5 oz-in	**1:1 HP 6V w/encoder**	
			2150 RPM	20 oz-in	**4.4:1 HP 6V w/encoder**	**4.4:1 HP 6V**
			990 RPM	39 oz-in	**9.7:1 HP 6V w/encoder**	**9.7:1 HP 6V**
			460 RPM	75 oz-in	**20.4:1 HP 6V w/encoder**	**20.4:1 HP 6V**
			280 RPM	90 oz-in	**34:1 HP 6V w/encoder**	**34:1 HP 6V**
			200 RPM	115 oz-in	**47:1 HP 6V w/encoder**	**47:1 HP 6V**
			130 RPM	150 oz-in	**75:1 HP 6V w/encoder**	**75:1 HP 6V**
			97 RPM	210 oz-in	**99:1 HP 6V w/encoder**	**99:1 HP 6V**

			56 RPM	350 oz-in	**172:1 HP 6V w/encoder**	**172:1 HP 6V**
6 V	low-power **(LP)**	2.4 A	6200 RPM	2 oz-in	**1:1 LP 6V w/encoder**	
			1300 RPM	8 oz-in	**4.4:1 LP 6V w/encoder**	**4.4:1 LP 6V**
			590 RPM	17 oz-in	**9.7:1 LP 6V w/encoder**	**9.7:1 LP 6V**
			290 RPM	33 oz-in	**20.4:1 LP 6V w/encoder**	**20.4:1 LP 6V**
			170 RPM	50 oz-in	**34:1 LP 6V w/encoder**	**34:1 LP 6V**
			120 RPM	65 oz-in	**47:1 LP 6V w/encoder**	**47:1 LP 6V**
			78 RPM	95 oz-in	**75:1 LP 6V w/encoder**	**75:1 LP 6V**
			58 RPM	130 oz-in	**99:1 LP 6V w/encoder**	**99:1 LP 6V**
			34 RPM	200 oz-in	**172:1 LP 6V w/encoder**	**172:1 LP 6V**
			25 RPM	220 oz-in	**227:1 LP 6V w/encoder**	**227:1 LP 6V**
			15 RPM	300 oz-in	**378:1 LP 6V w/encoder**	**378:1 LP 6V**
			11 RPM	400 oz-in	**499:1 LP 6V w/encoder**	**499:1 LP 6V**
12 V	high-power **(HP)**	5.6 A	10,200 RPM	5.5 oz-in	**1:1 HP 12V w/encoder**	
			2250 RPM	23 oz-in	**4.4:1 HP 12V w/encoder**	**4.4:1 HP 12V**
			1030 RPM	44 oz-in	**9.7:1 HP 12V w/encoder**	**9.7:1 HP 12V**
			500 RPM	85 oz-in	**20.4:1 HP 12V w/encoder**	**20.4:1 HP 12V**
			290 RPM	120 oz-in	**34:1 HP 12V w/encoder**	**34:1 HP 12V**
			210 RPM	165 oz-in	**47:1 HP 12V w/encoder**	**47:1 HP 12V**
			130 RPM	240 oz-in	**75:1 HP 12V w/encoder**	**75:1 HP 12V**
			100 RPM	300 oz-in	**99:1 HP 12V w/encoder**	**99:1 HP 12V**
12 V	medium-power **(MP)**	2.1 A	7800 RPM	2.7 oz-in	**1:1 MP 12V w/encoder**	
			1700 RPM	11 oz-in	**4.4:1 MP 12V w/encoder**	**4.4:1 MP 12V**
			770 RPM	22 oz-in	**9.7:1 MP 12V w/encoder**	**9.7:1 MP 12V**
			370 RPM	42 oz-in	**20.4:1 MP 12V w/encoder**	**20.4:1 MP 12V**
			220 RPM	63 oz-in	**34:1 MP 12V w/encoder**	**34:1 MP 12V**
			160 RPM	85 oz-in	**47:1 MP 12V w/encoder**	**47:1 MP 12V**
			100 RPM	125 oz-in	**75:1 MP 12V w/encoder**	**75:1 MP 12V**
			76 RPM	165 oz-in	**99:1 MP 12V w/encoder**	**99:1 MP 12V**
			43 RPM	250 oz-in	**172:1 MP 12V w/encoder**	**172:1 MP 12V**
			33 RPM	320 oz-in	**227:1 MP 12V w/encoder**	**227:1 MP 12V**
12 V	low-power **(LP)**	1.1 A	5600 RPM	2 oz-in	**1:1 LP 12V w/encoder**	
			1200 RPM	8 oz-in	**4.4:1 LP 12V w/encoder**	**4.4:1 LP 12V**
			560 RPM	15 oz-in	**9.7:1 LP 12V w/encoder**	**9.7:1 LP 12V**
			260 RPM	29 oz-in	**20.4:1 LP 12V w/encoder**	**20.4:1 LP 12V**
			150 RPM	43 oz-in	**34:1 LP 12V w/encoder**	**34:1 LP 12V**
			110 RPM	60 oz-in	**47:1 LP 12V w/encoder**	**47:1 LP 12V**
			71 RPM	85 oz-in	**75:1 LP 12V w/encoder**	**75:1 LP 12V**
			55 RPM	115 oz-in	**99:1 LP 12V w/encoder**	**99:1 LP 12V**
			31 RPM	180 oz-in	**172:1 LP 12V w/encoder**	**172:1 LP 12V**
			23 RPM	240 oz-in	**227:1 LP 12V w/encoder**	**227:1 LP 12V**
			14 RPM	320 oz-in	**378:1 LP 12V w/encoder**	**378:1 LP 12V**

Note: Stalling or overloading gearmotors can greatly decrease their lifetimes and even result in immediate damage. For these gearboxes, the recommended upper limit for instantaneous torque is 200 oz-in (15 kg-cm); we strongly advise keeping applied loads well under this limit. Stalls can also result in rapid (potentially on the order of seconds) thermal damage to the motor windings and brushes, especially for the versions that use high-power (HP) motors; a general recommendation for brushed DC motor operation is 25% or less of the stall current.

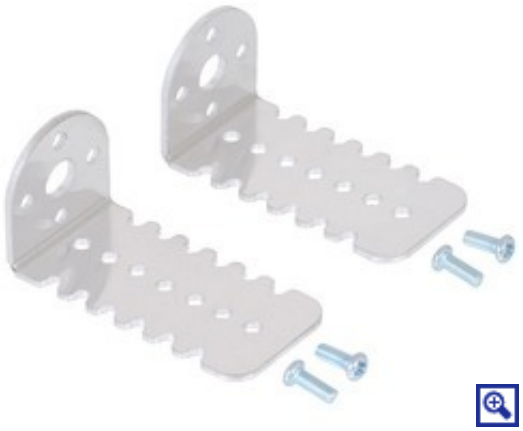
In general, these kinds of motors can run at voltages above and below their nominal voltages; lower voltages might not be practical, and higher voltages could start negatively affecting the life of the motor.

Details for item #1572

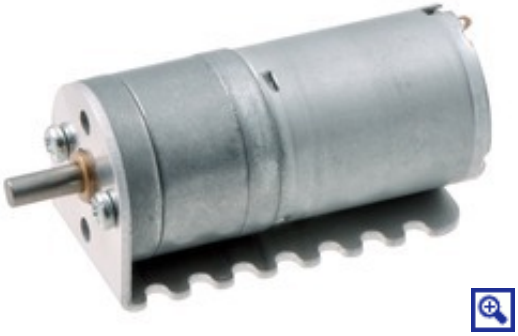
Exact gear ratio: $\frac{22 \times 22 \times 22 \times 23}{12 \times 10 \times 10 \times 10} \approx \mathbf{20.4:1}$

Gearmotor accessories

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 metal gearmotor bracket pair.



Pololu 25D mm gearmotor with bracket.

The 4 mm diameter gearbox output shaft works with **Pololu universal aluminum mounting hub for 4mm shafts**, which 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 as shown in the left picture below. Alternatively, you could use our **4mm 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.

Pololu 60×8mm wheel on a Pololu 25D mm metal gearmotor.

A 25D mm gearmotor connected to a scooter wheel by the 4 mm scooter wheel adapter.

These are the same type of motors used in the **Wild Thumper all-terrain chassis**, so the gearbox's output shaft also works directly with the hex adapters included with the 120mm-diameter **Wild Thumper wheels** (the left picture below shows a 25D mm gearmotor while the right picture shows the smaller 20D mm gearmotor):

Dagu Wild Thumper wheel 120×60mm (chrome) with Pololu 25D mm metal gearmotor.

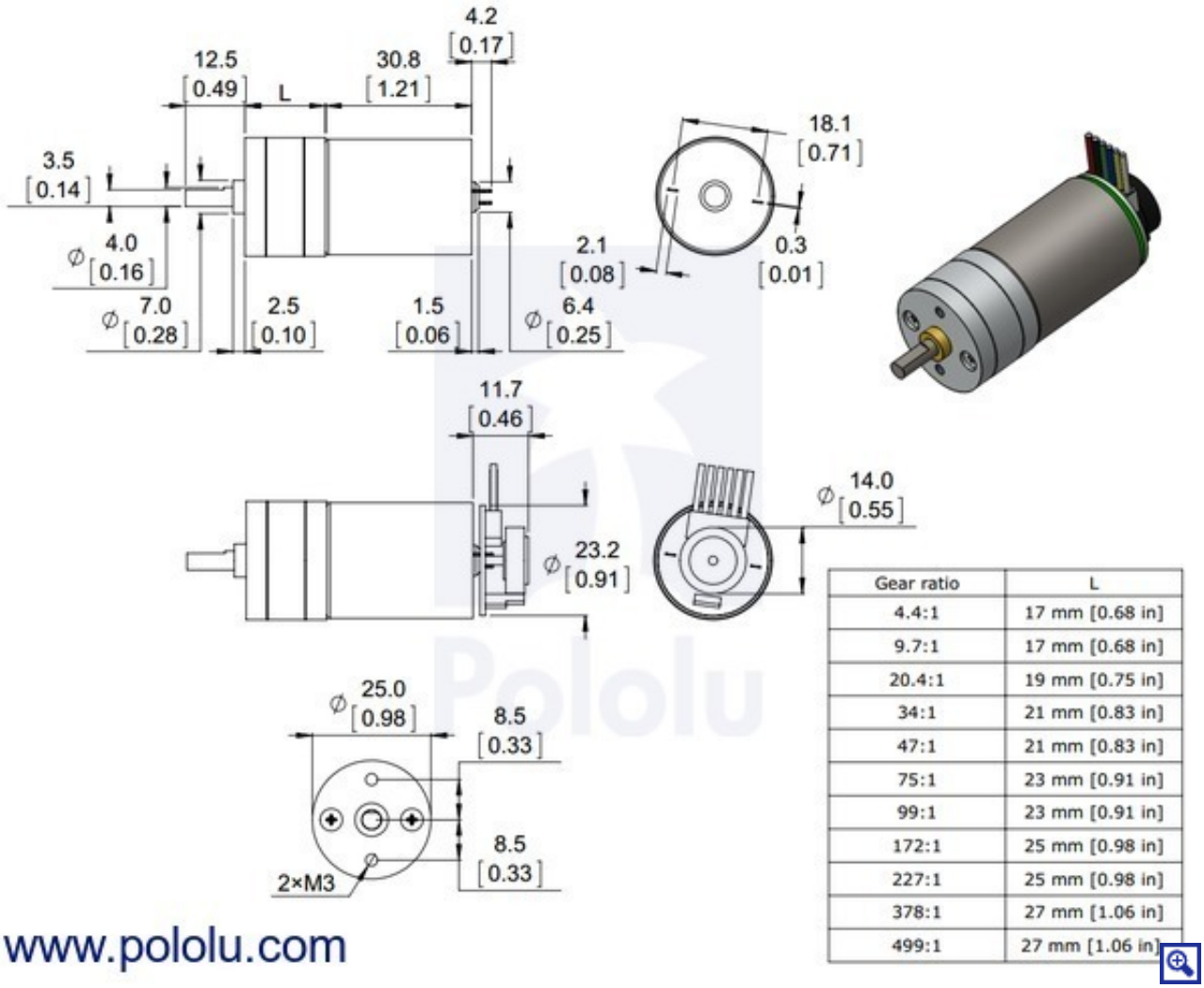
Dagu Wild Thumper wheel 120×60mm (metallic red) with Pololu 20D mm metal gearmotor.

For a general-purpose hex adapter, consider our **12mm hex wheel adapter**, which lets you use this motor with many common hobby RC wheels.

12mm Hex Wheel Adapter for 4mm Shaft on a 20D mm Metal Gearmotor.

Dimensions

The diagram below shows the dimensions of the 25D mm line of gearmotors (units are mm over [inches]). This diagram is also available as a **downloadable PDF** (223k pdf).

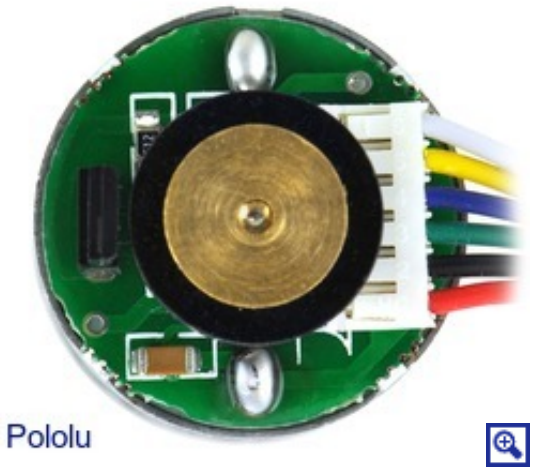


Gear ratio	L
4.4:1	17 mm [0.68 in]
9.7:1	17 mm [0.68 in]
20.4:1	19 mm [0.75 in]
34:1	21 mm [0.83 in]
47:1	21 mm [0.83 in]
75:1	23 mm [0.91 in]
99:1	23 mm [0.91 in]
172:1	25 mm [0.98 in]
227:1	25 mm [0.98 in]
378:1	27 mm [1.06 in]
499:1	27 mm [1.06 in]

Dimensions of the Pololu 25D mm metal gearmotors. Units are mm over [inches].

Using the encoder (if applicable)

The versions of these gearmotors with encoders use a A two-channel Hall effect sensor to detect 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 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:



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 6V 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.

Some of the Pololu metal gearmotors.

People often buy this product together with:

Pololu Universal Aluminum Mounting Hub for 4mm Shaft, #4-40 Holes (2-Pack)

9.7:1 Metal Gearmotor 25Dx48L mm HP 6V

Pololu 25D mm Metal Gearmotor Bracket Pair