We selected this geared motor because of its efficiency and a construction with enough space inside to add an encoder that allows to know with a simple software the exact distance covered by the robot and its speed.

A disk with two or 6 magnets must be inserted on the pinion. Two hall sensors generate the quadrature signals any microcontroller can decode. A motor driver (H-bridge) is already on the PCB. Find 4 bits on your microcontroller, 2 inputs and 2 outputs, and the interface is done.

A 6-pin SIL connector (2.54mm) interface with the Hall sensors and the motor. Software can decode 12 edges per turn, evenly spaced.

**Connector pinout**
1 Gnd (square pad)
2 Vcc 3.5 to 6 Volts
3 Encoder channel 1
4 Encoder channel 2
5 Motor control 1
6 Motor control 2

Alu motor holder

We work on wheels and levers

**How to install the encoder**
Open the motor, remove the gears

Use a plier cutter and a plier to cut and break the side next to the motor, leaving 4-5mm every side.
Finish with a sharp knife, so the opening is symmetrical and 18mm wide. Check the PCB inserts in the slots. Must be a tight fit preferably.

One option to hold the PCB is to use two M1.6x4 screws. You need to drill with a 1.3-1.4 mm drill through the PCB holes, then remove the PCB and enlarge the hole in the plastic to 1.6-1.7mm.

Remove the motor pinion and insert the disk. Put the pinion back, check for a small play between the gear and motor bearing, so it spins freely.

Insert the first gear. There is enough space for the magnets and it will not touch, except if the pinion is not correctly inserted. Check the PCB again. Distance between magnets and Hall sensors is not critical. Of course it must not touch. 1 mm gap is still acceptable.
Solder the connectors. Male connectors are logical, since the motor is a slave receiving the power, but you may have your reason to use male, female, straight or 90 degrees, 0.5mm or 0.7mm pins. Micromatch and flat cable is a more professional option. Put the PCB in place, Cut, strip and solder the motor wires.

Decide how you will hold the PCB. If you have drilled the holes, just use the screws. If you prefer to glue, that’s OK. If you consider the fit is tight enough, check from times to times what is the effect of vibrations.

**Note about PWM/PFM**

Recommended PWM or PFM frequency is in the range of 500 – 1000 Hz.


**Encoder signals**

What is usually done is to sample the two outputs at 1 khz min and apply the algorithm the most suited for the processor and language you use. See our document for more explanations and example of optimized Microchip Pic program.

Simpler algorithms can be used if only position in one direction has to be known or if only speed is important.

**Specifications for the motor driver**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage</td>
<td>12V</td>
</tr>
<tr>
<td>Current</td>
<td>2.5A</td>
</tr>
<tr>
<td>Power</td>
<td>30W</td>
</tr>
</tbody>
</table>

**Note**

L9110 is the driver for brushless DC motors designed for serial communication. It is compatible with Microchip's PIC microcontrollers. The driver can be configured for different duty cycles and can handle both PWM and PFM commands. The driver is capable of handling motors up to 30W and can be used in applications requiring high torque and speed control.

- **Input Voltage**: 9V to 24V
- **Current**: 2.5A
- **Power**: 30W
- **Duty Cycle**: 0% to 100%
- **PWM Frequency**: 1kHz to 20kHz

**Applications**

- Industrial automation
- Robotics
- Electric vehicles

**Important Points**

- Ensure proper grounding of the motor and driver to avoid electrical noise.
- Use a suitable heat sink to manage the driver's temperature.
- Regular maintenance and cleaning to prevent dust accumulation.