

SELECTION OF MOTOR

Our cart utilizes **750Watts BLDC Motor** (brushless DC) of the following specification. The reason for choosing it and its test characteristics are discussed further below.

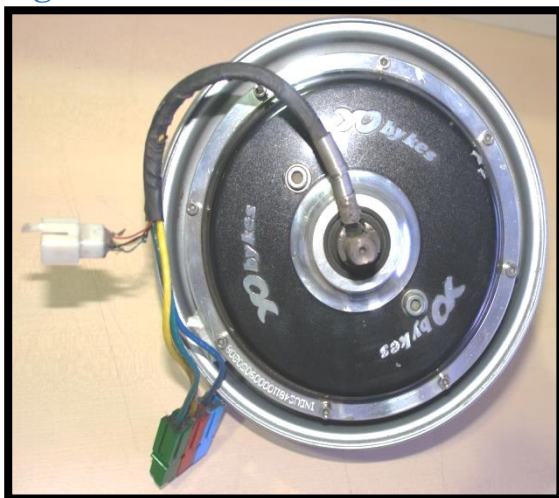
Brushless Direct Current (BLDC) motor is a type of synchronous motor, where magnetic fields generated by both stator and rotate have the same frequency. The BLDC motor has a longer life because no brushes are needed. Apart from that, it has a high starting torque, high no-load speed and small energy losses. The BLDC motor can be configured in 1-phase, 2-phase, and 3-phase. Three-phase motors are the most popular among all the configurations and are widely used in e-bikes.

We have selected hub motor because the motor replaces the hub of wheel. Coupling loss is reduced and mounting can be made easy without the use of chains or belts, and that reduces size and weight of the cart.

SPECIFICATION OF MOTOR:

Motor type:	BLDC-hub type
Power rating:	750W
Voltage:	48V
Load:	200kg
Speed:	835.88rpm
Weight:	10kg(max)
Wheel size:	10 inch dia
No. of poles	6
No. of phases	3
Manufacturer	YO bikes

Figure:



MOTOR:

- It located in the rear wheel as hub motor.
- It is special type of motor PMBLDC (Permanent Brushless Dc Motor).
- It mainly consists two parts named
 1. Stator
 2. Rotor
- Stator is a combination of Salient poles & Stator back iron.
- Rotor is a combination of Permanent magnet & Outer rotor back iron.
- Motor is equipped with electronic sensors.
- This hall sensor is mounted on stator very precisely.

Operation:

- BLDC motors are basically inside-out DC motors.in a DC motor the stator is a permanent magnet. The rotor has the windings, which are excited with a current. The current in the rotor is reversed to create a rotating or moving electric field by means of a split commutator and brushes. On the other hand, in a BLDC motor the windings are on the stator and the rotor is a permanent magnet. Hence the term inside-out DC motor.
- To make the rotor turn, there must be a rotating electric field. Typically a three phase BLDC motor has three stator phases that are excited two at a time to create a rotating electric field. This method is fairly easy to implement, but to prevent the permanent magnet rotor from getting locked with stator.
- The excitation on the stator must be sequenced in a specific manner while knowing the exact position of the rotor magnets.

HALL EFFECT SENSOR:

- Position information can be gotten by Hall Effect sensors that detect the rotor magnet position.
- For a typical three phase, sensored BLDC motor there are six distinct regions or sectors in which two specific windings are excited.

SPEED vs TORQUE:

Diameter of wheel =10 inches

Radius of wheel =0.127m

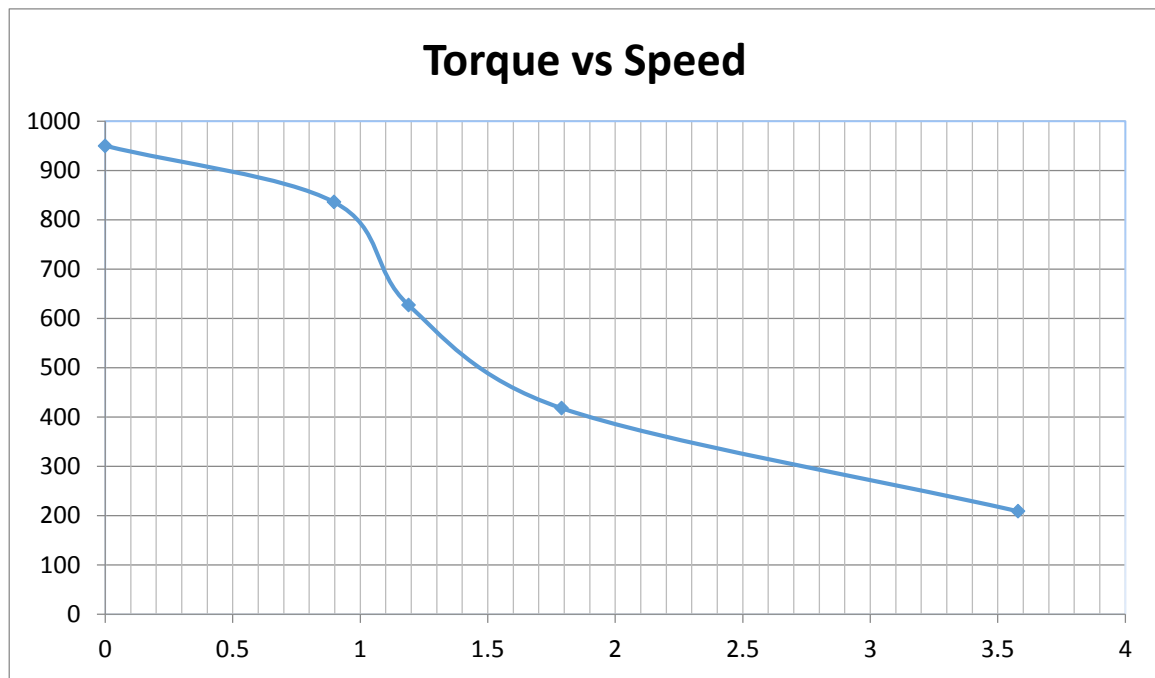
FORMULAS:

1. Speed in rpm=(speed in km/hr *1000)/(2*pi*radius*60)
2. Torque=power(watts) / speed(rpm)

Radius=0.127m

SPEED (KM/HR)	SPEED(RPM)	TORQUE(NM)
10	208.97	3.58
20	417.94	1.79
30	626.91	1.19
40	835.88	0.897

Mechanical characteristics:



Load Test:

<u>S.NO</u>	<u>WEIGHT</u>	<u>SPEED(KM/HR)</u>	<u>SPEED(RPM)</u>	<u>CURRENT TO MOTOR(AC) IN AMPS</u>	<u>CURRENT TO CONTROLLER(DC) IN AMPS</u>
1	NO LOAD	10	208.97	4.1	0.1
2		20	417.94	4.1	0.1
3		30	626.91	4.1	0.1
4		40	835.88	4.1	0.2
5	200	10	208.97	10	0.6
6		20	417.94	15	1.2
7		30	626.91	16	1.2
8		40	835.88	25	3.0
9	300	10	208.97	18.5	0.2
10		20	417.94	27.5	0.4
11		30	626.91	28.1	0.7
12		40	835.88	29.5	2.9

Input current vs Speed

