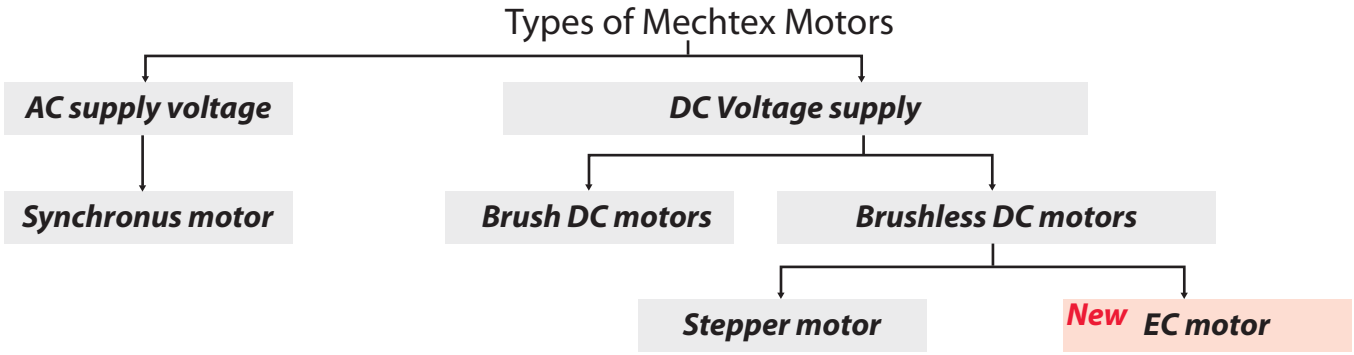
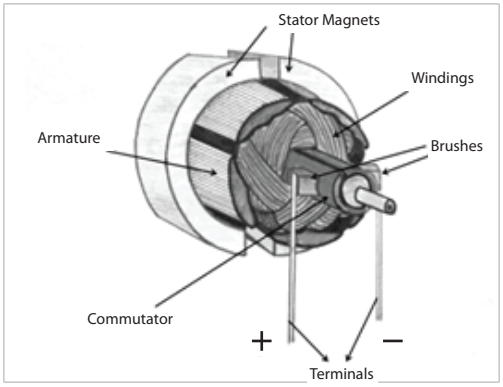
Brushless DC motor Introduction

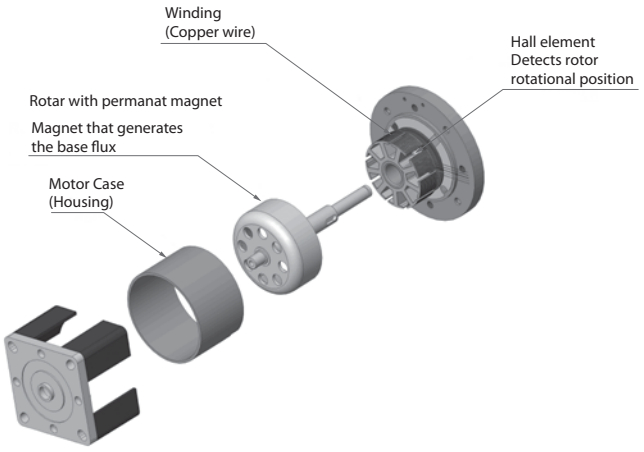


Generally speaking, a BLDC motor is considered to be a high performance motor i.e. capable of providing large amounts of torque over a vast speed range. BLDC motors are a derivative of the most commonly used DC motor, the brushed DC motor, and they share the same torque & speed performance curve characteristics. The major difference between the two is the use of brushes. BLDC motors do not have brushes (hence the name "brushless DC") and must be electronically commutated.

Parameter	DC brush motor	BLDC motor
Mechanical structure	Field magnets on stator	Field magnets on rotor similar to the AC synchronous motor
Distinctive feature	Simple construction	Long lasting & No maintanance
Commutation method	Mechanical contact between brushes and commutator	Electronic switching using transistors
Rotors run position	Automatically by brushes	Hall element, Optical encoder
Reversing method	By reverse of terminal voltage	Rearranging logic sequence



Brushed DC Motor



Brushless DC Motor

Advantages of DC motors
- Low initial cost
- Simple control of motor speed

Disadvantages of DC motor
- Low Life - span for high intensity uses
- High maintenance
- High noise & Low reliability
- Low efficiency

Advantages of BLDC EC motors
- Long life span (about 5000Hrs. or more)
- Little or no maintenance
- High efficiency & High reliability
- High power-to-volume ratio

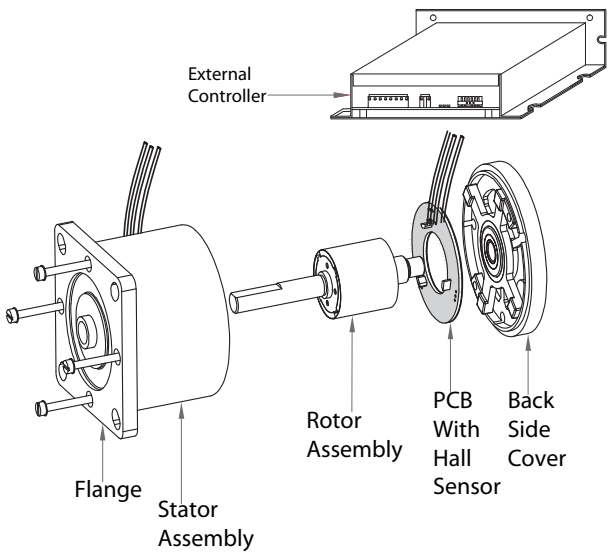
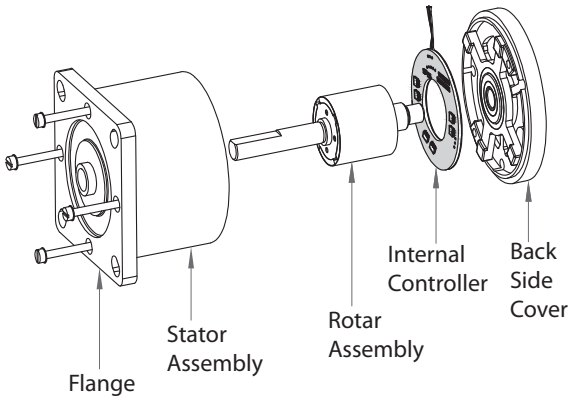
Disadvantages of BLDC EC motors
- High initial cost
- Additional motor speed controller

Brushless DC motor introduction

On the basis of magnet mounting:

A) In runner motor:

- In runner have an axle which rotates within a stationary housing.
- Rotor is mounted on the axle and rotates inside the surrounding stator.
- Rotor is comprised of segmented permanent magnets with alternating
- magnetic poles i.e. S and N poles respectively.
- In this motors are possible with two combinations i.e. with hall sensor and without hall sensor.

H) With Hall sensor	S) Without Hall sensor
	
3 Sensors embedded in stator	No sensors in stator
Hall sensors detect angular position of motor	Instead of Hall sensor signals back EMF signals commuted
These signals enable the driver circuitry to find the optimal switching time for the 3 windings.	Control is shifted to the back EMF sensing

B) Out runner motor:

- Split-barrel design that is comprised of a base (non-rotating stator) and a drum (rotating rotor)
- Drum holds the internal permanent magnets and is fastened to the axle.
- The drum, axle and internal magnets all form the Rotor.
- Inside the drum, and attached to the base, is the Stator and Coil Windings.
- The rotor magnets act as an insulator, thereby reducing the rate of heat dissipation from the motor.
- Due to the location of the stator windings, outer rotor designs typically operate at lower duty cycles or at a lower rated current.
- The primary advantage of an outer rotor BLDC motor is relatively low detent torque.