

Motor Construction and Operation

The torque is proportional to the square of the sum of the bias magnetic flux Φ_m , due to the permanent magnet and the excitation magnetic flux of windings.

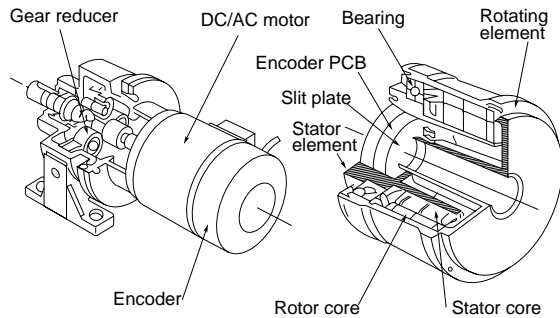
$$T \propto (\Phi_m + \Phi_c)^2$$

High torque is generated due to the following factors. First, the motor diameter is large. The tangential forces between rotor and stator act at a large radius, resulting in higher torque. Secondly, a large number of small rotor and stator teeth create many magnetic cycles per motor revolution. More working cycles means increased torque.

Direct drive systems couple the load of the system directly to the motor without the use of belts or gears. Most servo motors, brushed or brushless, often lack adequate torque or resolution to satisfy application needs. Therefore, mechanical means, such as gear reduction systems are implemented to meet system requirements. The Dynaserv can provide very high torque in a modest package size and solve many of the performance issues of the gear reducer. All this in a system that is as easy to use as a stepping motor.

The figure below shows the construction of the Dynaserv DM Series direct drive motor compared to a conventional motor with a gear reducer. As shown in the figure, the gear reducer relies on frictional contact to reduce the speed of the load. This gearing effectively increases torque and resolution but sacrifices speed and accuracy. The direct drive motor is brushless and gearless so it eliminates friction from its power transmission. Since the feedback element is coupled directly to the load, system accuracy and repeatability are greatly increased and backlash is eliminated.

Conventional Motor/Gear Reducer vs. Dynaserv

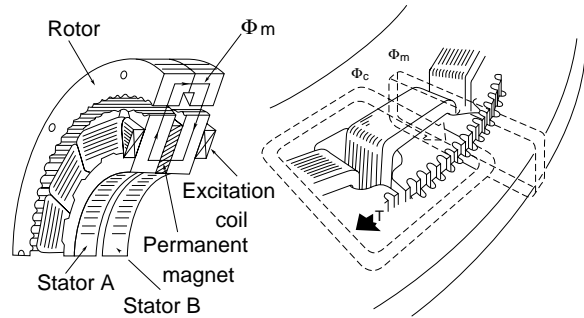


DM Series

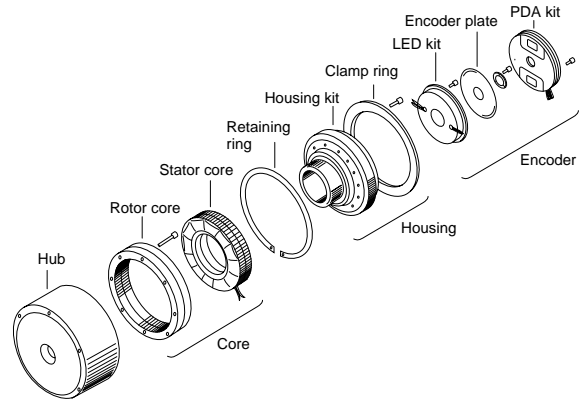
Gear Reducer System Limitations

- Backlash limits positional accuracy
- Gearing causes a trade-off between speed and resolution
- Inefficiently transfers torque

Magnetic Circuit



Exploded View of the Dynaserv Motor Model DM



- Friction introduces inaccuracies and non-linearities
- Gearing reduces stiffness at the load

The motor contains precision bearings, magnetic components and integral feedback in a compact motor package. The motor is an outer rotor type, providing direct motion of the outside housing of the motor and thus the load. The cross roller bearings which support the rotor have high stiffness, to allow the motor to be connected directly to the load. In most cases it is not necessary to use additional bearings or connecting shafts.