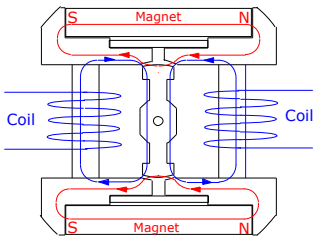
INTRODUCTION TO TORQUE MOTORS

The torque motor is a magnetic bridge circuit where two of the branches are formed by the static flux from permanent magnets and the two other branches are formed by the fluxes generated in the control coils.

The armature takes up a position which bridges the stator poles thereby maintaining a state of magnetic balance in the four air gaps.

When a signal is applied to the control coils then a state of magnetic inbalance can be created and the armature rotates to a new position to re-balance the magnetic bridge circuit. The coils can either be fed from a single ended or differential source.

In single ended applications the coils are connected in series and the armature rotates in a a direction determined by the the direction of current. In off load conditions the degree of rotation is directly related to the current flowing. Under loaded conditions the armature rotates to a position where the torque produced by the control current is equal and opposite to the applied load torque.



Basic Magnetic Circuit of Torque Motor

As torque output is proportional to the applied current it is possible to position a load anywhere within the angular deflection range of the torque motor.

Similarly in differential applications the torque output and deflection can be related to the differential between the currents flowing in each half of the control circuit.

Where there is more than one input channel split coils can be provided to allow for greater control.

The static flux generated by the magnets gives the unit an inherent stiffness, which can be adjusted to optimise response time, sensitivity and hysteresis according to the demands of the application.

Typically units fall within a 35mm cube space envelope. Endplates and shafts are configured to suit each application.

Typical graphs are shown for a CTM2- type motor with 2 x 20Ω coils connected in series:-

Graph 1 shows the Open Loop Current Vs Displacement Characteristic under zero load. When used closed loop with position feedback linearity of 0.1% of full scale deflection can be achieved.

Graph 2 shows the Torque output at Null Vs Current

Graph 3 shows the Torque Vs Displacement Characteristic at different levels of standing currents.

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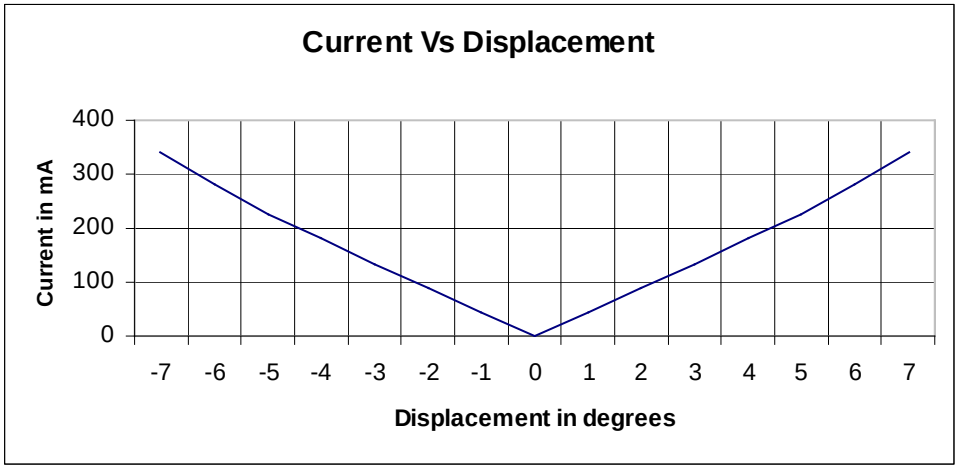
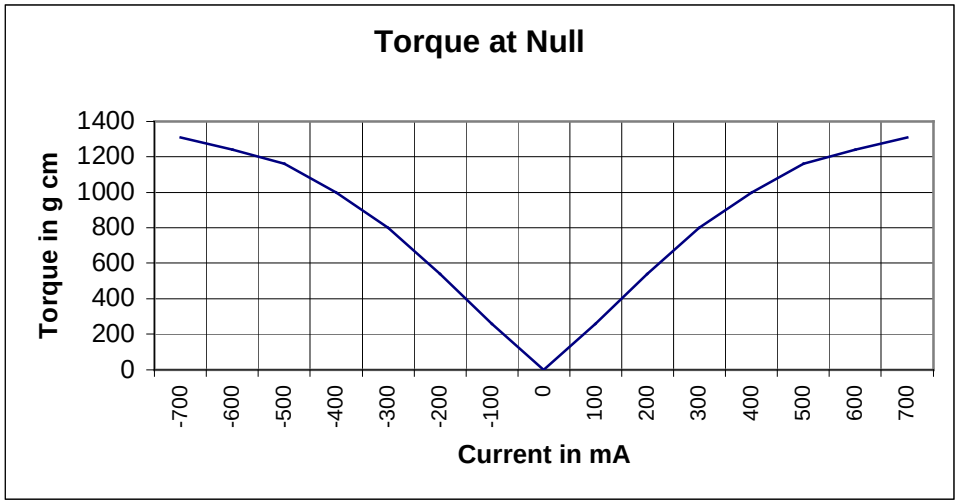
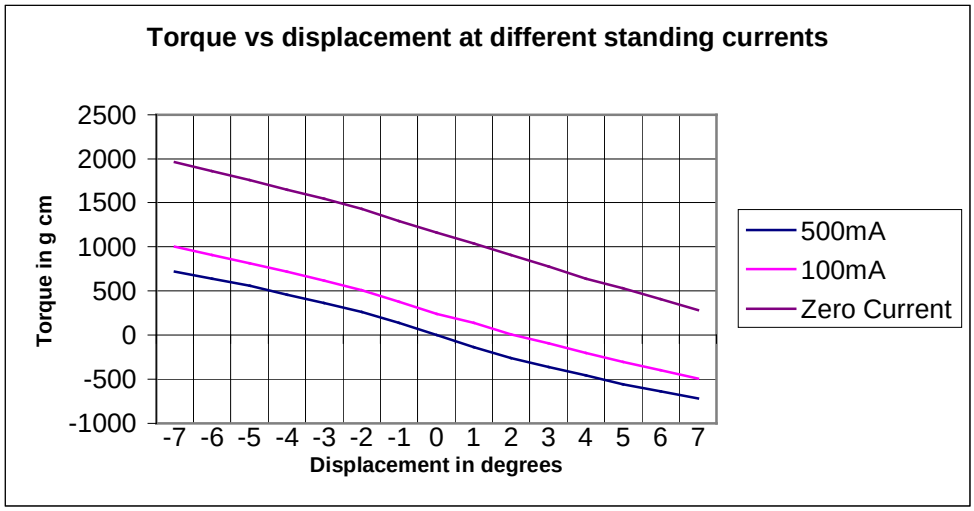


Graph 1



Graph 2



Graph 3

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