Technical Notes (Continued)

Torque vs. Speed Characteristics

Many factors determine the torque vs. speed characteristics of a Step Motor. These include the design of the drive system and the voltage supplied to the motor, as well as the inductance rating of the motor used.

Effects of Drive Design

Drive design is an important factor in determining the overall performance which will be obtained. The types of drives, and their effects on motor performance, are as follows:

L/R Drives – This design was the basis for most older drives and is still used on some existing drives. It allows half-or full-step motor operation, but does not permit variable control of current level. L/R drives also require dropping resistors, which reduce motor efficiency. L/R drives provide satisfactory performance at lower stepping rates, but do not have good high speed capabilities. This is the most basic drive design.

Constant Current Chopper Drives – These drives maintain relatively constant current to the motor at all speeds, and therefore offer good stepping performance at rates up to approximately 10,000 steps per second. Although more costly and complex than L/R drives, they allow use of features such as closed-loop control, microstepping, current boost, and stabilization that improve motor performance.

Line Operated, High Voltage Chopper Drives – These drives deliver higher voltage to the motor for optimum high speed performance. They are also able to operate larger motors to provide high performance and excellent efficiency. Since they do not need bulky stepdown transformers, line operated drives are more compact than other chopper drives.

Effects of Motor Voltage

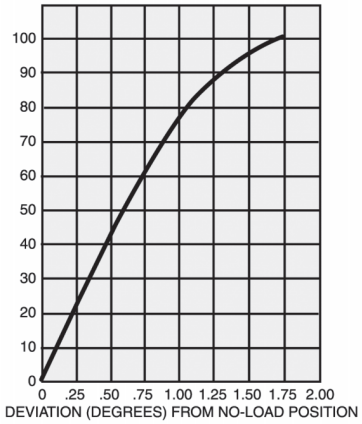
Motor performance at mid-range and high-range speeds can be improved by increasing the voltage to the motor. However, the motor will operate at a high temperature when the voltage is increased, so some means of cooling may be necessary. In general, motor supply voltage does not affect operation at lower speeds.

Motor Inductance Effects

For a given supply voltage, a low inductance motor will give better performance at high speeds than a high inductance motor, but will operate at a higher temperature. This is true because current will increase faster in a low inductance winding, each time the winding power is switched. High inductance motors yield higher maximum torque and operate cooler, but their top speed is limited and torque falls off more rapidly as speed rises, versus a lower inductance motor.

Angular Position Deviation

When a load is applied to a step motor shaft, the shaft will rotate slightly from the no load position. The Angular Position Deviation curve shows shaft deviation from the no load position vs. percent of rated holding torque. This curve is valid for all Superior Electric 1.8° step motors.

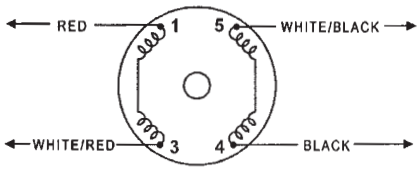


ANGULAR POSITION DEVIATION

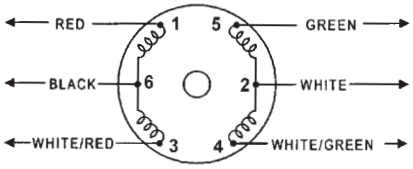
NOTE: Proper construction of the mechanism of the driven load is essential in order to accurately achieve a true versus theoretical position.

Connection Diagrams

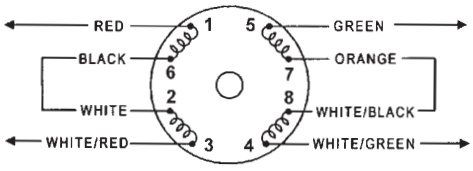
4 Lead Motors



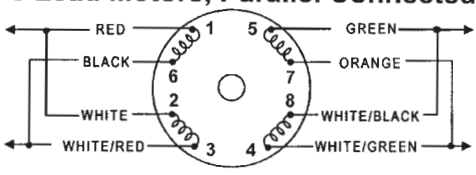
6 Lead Motors



8 Lead Motors, Series Connected



8 Lead Motors, Parallel Connected



NOTE: Numbers identify terminal board connections.