

## CHOOSING A STEP MOTOR AND POWER SUPPLY VOLTAGE

The choice of a step motor and power supply voltage is entirely application dependent. Ideally the motor should deliver sufficient torque at the highest speed the application requires and no more.

Any torque capability in excess of what the application requires comes at the high cost of unnecessary motor heating. Excess torque capability beyond a reasonable safety margin will never be used but will exact the penalty of an oversize power supply, drive stress and motor temperature.

Learn to distinguish the difference between torque and power. High initial torque at low speed does not mean efficient motor utilization. Usually power is the more important. Bias the motor's operating point through power transmission gearing to operate the motor at its maximum power; normally just past its corner frequency.

The maximum shaft power obtainable with the drive is around 250 Watts, or 1/3 of a horsepower. This is primarily achieved with double and triple stacked size 34 motors.

Size 23 motors are physically too small to dissipate the resultant heat and size 42 motors are too big to be properly impedance matched; if their rated current is less than the 7 Amp limit of the drive, then the optimum overdrive voltage is beyond the 80 Volt limit. If the rated voltage is less than 1/25 of 80 Volts, then the phase current will probably exceed 7 Amps.

Also the detent torque on a size 42 motor is significantly higher than in smaller motors. This detent torque is always a loss that must be subtracted from the potential available power output of the motor; in other words its output power drops more rapidly with speed than smaller motors. Use size 42 motors only if high torque is required at low speed and it is not practical to gear down a smaller motor.

An efficient motor, defined as the smallest motor sufficient to meet the demands of the application, will run hot. Think of the motor as having a fixed power conversion efficiency. Some percentage of the input power will be converted to heat; the rest will be converted to mechanical power. To get the maximum performance from the motor, the waste heat must be just under what the motor can tolerate. Usually this motor will be biased to operate just past the corner speed as well.

The place to start is to determine the load torque in oz/in. Be sure to include the torque necessary to accelerate the load. Next come up with the maximum speed the application has to operate at in full steps per second. Multiply the two together and then divide the result by 4506 to calculate the power in watts necessary to meet the application requirements. Pick a motor at a power supply voltage that provides a 40 percent reserve power margin above your requirements.