Mechatronics Center
MACHINE AUTOMATION

MATCHING **MOTORS TO AMPLIFIERS**

GATHER THESE PARAMETERS (NOT ALL ARE USED IN ALL SYSTEMS):

Motor

Type (brush, brushless servo, stepper)
# of Phases
Ipeak (peak current)
Irms (continuos current)
T_{rms} (at what temp? 25C, 40C?)
Vpeak (max bus voltage)
ω_m (peak motor speed)
J_m (motor inertia)
Tp (peak torque)
K_T (torque constant)
K_e (back emf constant)
commutation type
Inductance
Resistance
Static Friction

Amplifier

Type (brush, brushless servo, stepper)
Commutation
Bus Voltage
Line Voltage In (AC or DC)
Type of current control (PWM, Linear)
Irms
Ipeak
Minimum acceptable motor inductance
PWM switching frequency (higher needed in tiny motors)

Power Supply

Bus Voltage out
Line Voltage In
Regen Capacity (if any, how much?)
Capacitance (Voltage Ripple)
Ipeak
Irms
Type (Linear, switching)

BASED ON THE ABOVE PARAMETERS, FOLLOW THESE STEPS IN ROUGH ORDER:

1. Determined Tp and ω required.
2. What line voltage is available?
3. Choose motor w/Tp, ωm
4. Use kT to find how much Ipeak is needed for Tp.
5. Use ke to find how much Vpeak is needed to go ω. Ke(V/krpm)=0.740KT(oz-in/amp) Or = Vrms/ωrms
6. Choose type of amp to match motor (also consider commutation type: sine vs trapezoidal)
7. Choose the amplifier that has sufficient Ipeak and Icont, Vbus
8. Check line voltage of the amp, see if an external power supply is needed.
9. If Amp takes AC input, skip to step 12.
10. Pick P.S. compatible with line, DC voltage, & current requirements
11. Is a switching power supply needed? If not, confirm that max voltage does not exceed amp max voltage.
12. If match between power supply, amp, and motor is difficult, consider change in motor winding.
13. Check regen in amp and/or power supply
14. Confirm that the min. inductance of the amp is less than the motor.