Selecting the suitable power rating

Due to the modular nature of the equipment in this brochure the entire range of systems provide the control flexibility to meet the requirements of most modern motion systems. The most important first step in selecting a suitable drive system is therefore to consider the power factor required in order to select the correct motor size. To do so it is necessary to consider the necessary drive torque and the matching of the load inertia to the proposed motor.

Operating drive torque.

The torque necessary to accelerate and drive the mechanism at the desired speed needs to be calculated, the necessary formulae for this being readily available in most engineering text books. The steady state drive torque may be the predominant factor in selecting the motor. If for example, a load is to be driven vertically this is likely to be the case and when a maximum speed lower than 800 rpm is required a geared motor is likely to be the optimum solution. This is because the motor may then be operated at a speed where it's power delivery is highest, the available torque being multiplied by the gear ratio, less gearbox losses which are relatively small. If however the drive is required to provide motion in a horizontal plane, it may be the case that the mechanism's inertia is the most critical factor in selecting a suitable motor.

Matching the load inertia

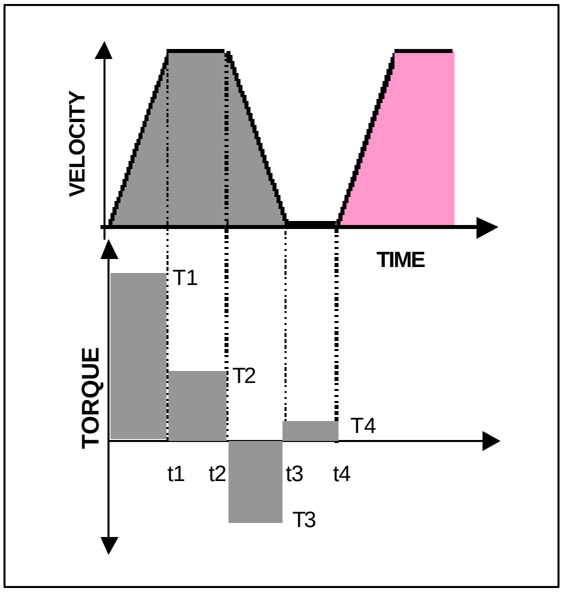
The driven mechanism's inertia is important for two reasons. Firstly, it will be necessary to select a motor with sufficient peak torque to accelerate the load and the motor's own rotor at the required rate. Where the maximum possible acceleration is required the best results are likely to be achieved when a motor with a similar rotor inertia to that of the load is selected. Choosing a motor with a significantly higher rotor inertia results in most of the energy being used to accelerate the motor and not the load in applications where the steady state torque requirement is low. Secondly, it is recommended that the load inertia does not exceed more than 5 times that of the motor since this can result in poor response and instability in positioning systems. In certain cases this '5 times Rule' can be exceeded but it is recommended that technical advice is obtained before specifying such a system. Once again if the maximum required speed is less than 800 rpm a geared motor solution is preferable. This will not only provide improved control sensitivity but the load's inertia related to the motor is reduced by the square of the gear ratio so even modest gear reductions can enable much smaller motors to be used in applications with high inertia.

Analysing torque requirements

While the necessary formulae for calculating steady state and acceleration torque may be obtained from a suitable reference book our technical sales engineers will be pleased to help in analysing application load requirements.

Sizing a motor for repetitive cycle operation

From above it will be seen that when a motor drives a load a peak torque will be required during acceleration and stopping while a steady-state torque will be needed to maintain the speed required. If, for example the load is driven vertically or on an incline a holding torque will also be required. A typical velocity and torque profile for a single cycle will be as shown:



The RMS torque required may be calculated as follows:

$$T_{RMS} = \sqrt{\frac{T1^2t1 + T2^2t2 + T3^2t3 + T4^2t4}{t\ total}}$$

where T= Torque
t = time

When selecting a servo motor ensure that :

- Motor Peak torque $\geq$ Acceleration /Deceleration Torque required
- Motor rated torque $\geq T_{RMS}$