

The Technical Note is pertinent to the Unidrive Family

Servo Motor Selection

Introduction:

Control Techniques in North America now offers several distinct ranges of servo motors for use with Unidrive. These ranges have different performance characteristics making each of them particularly suited for certain types of application. The converse of this is that a particular motor range may also be unsuited for other applications. The purpose of this tech note is to assist our sales and application engineers in making the decision on which motor would be best suited for a particular type of application.

Application types:

Most servo applications may be broadly divided into two categories:

1. Point to Point Indexing.

This type of application generally requires that the system move a load from point A to point B as quickly as possible. It usually requires a motor with the lowest possible rotor inertia, commensurate with maintaining the load to motor reflected inertia within a 10:1 ratio.

2. Variable feed applications:

Variable feed applications need to be able to move a load at a varying range of speeds, machine tool axes are one example of these.

In these applications the most important characteristic is that the motor is capable of moving the load smoothly over a wide speed range, perhaps down to speeds below 1 rpm and up to the rated speed of the motor. In these cases a motor with the best possible feedback resolution, for smooth commutation together with low cogging torque is needed. Optimum performance in these applications is also usually obtained by keeping the load to motor reflected inertia within a 5:1 ratio and this means that a higher rotor inertia may actually be an advantage.

Control Techniques Motor ranges:

This tech note will outline the salient characteristics of the 3 servo motor ranges offered by Control Techniques in the US.

1. NT Motor.

The NT motor has exceptionally low inertia and a very high torque output for its physical size. It also has a high rated speed. These characteristics make it the ultimate choice for smaller, high speed, point to point indexing systems. The very low inertia coupled with the relatively low encoder resolution of 2048 lines mean it is not a good choice for variable feed applications.

2. Magna Motor.

The Magna motor again has a low rotor inertia making it a good choice for high speed point to point applications. It is available in a wider range of torque output than the NT motor making it suitable for larger applications. It may also be the preferred choice over the NT motor where inertia ratio may be a problem. The Magna motor does have a high cogging torque and relatively low encoder resolution of 2048 lines. Due to this its' performance below 500 rpm is not as smooth as it may need to be and for this reason should not be used in variable feed applications.

3. Unimotor.

The Unimotor has higher rotor inertia than the Magna and NT motors so it will perform less well in high speed, point to point indexing applications. The higher rotor inertia, together with the fact that the Unimotor has exceptionally low cogging torque and a feedback resolution of 4096 ppr * make it particularly suitable for the variable feed applications. The Unimotor is also available in a high inertia version by special order, this option may confer the ability to keep within a 5:1 inertia ratio when the standard inertia does not.

In addition to the regular incremental encoder the Unimotor is also offered with the following optional feedback devices:

a). **Resolver**: This is suitable for use in higher temperature environments, the motor is rated at 125⁰ C where the standard rating is 100⁰ C. It is also much less susceptible to vibration and shock loading than an encoder. The resolution of the resolver is effectively 4096 ppr. It should, however be borne in mind that due to mechanical constraints, accuracy suffers, compared to an encoder of similar resolution when used for position feedback to a position controller. This limitation applies to either the UD7x position controller or when the simulated encoder output is used as position feedback to an external position controller such as the Axima. Whilst the loss of accuracy is relatively small it may be important in an application such as a machine tool.

b). **SinCos Encoder**: At 1048576 counts per revolution this offers much higher resolution than either the standard encoder or the resolver. It also offers absolute positioning capability up to 4096 motor revolutions, obviating the need for homing routines in many applications. The main limitation of this option is that these advantages can only be realized by an application using the position controller in a Unidrive drive UD7x co-processor module.

* Unimotors with rated speeds higher than 3000 rpm together with the 230 volt EZ range have an encoder resolution of 2048 lines.

