Encoders

Linear and rotary incremental encoders can be mounted to most *LINTECH* positioning tables. These encoders provide a differential square wave A, B and Z (marker pulse), TTL signals (+ 5 VDC) that are compatible with most motion controllers.

Linear encoders can be mounted along side any screw driven positioning table. These incremental encoders are provided in either an English resolution (i.e. 0.0001 inch/pulse) or a Metric resolution (i.e. 1 micron/pulse). The encoder precision etched glass scale is packaged in an aluminum housing, which is mounted to the table base (or end plates) and is protected with seals (IP53) over the entire length of travel. The encoder read head is mounted to the table carriage and is supplied with a high flex, shielded 10 foot (3 m) cable that is terminated to a 12 pin DIN connector. There is a mating DIN connector supplied for easy wiring to the motor control system. The linear encoder option is ideal for those applications where closed loop positioning is required. The attached motor (stepper or servo) & controller will move the table until a set amount of encoder pulses has been recorded by the position controller. The process of positioning to the encoder (closed loop) in an application, eliminates positioning problems due to screw lead errors, coupling wind-up, mechanical backlash, and unexpected motor stalls. In order to position to 1 pulse of an encoder the motor/screw resolution needs to be 4 times greater than the encoder resolution. For example:

* using a 0.0001 inch/pulse encoder
* with a 0.200 inch/rev ball screw
* requires motor/controller with minimum resolution of:

$$\frac{\textbf{.200}\ \text{in}}{\text{rev}} \times \frac{\text{pulse}}{\textbf{.0001}\ \text{in}} \times \textbf{4} = \textbf{8000}\ \text{pulses/rev}$$

This resolution ratio of the motor/drive/table versus encoder will help prevent "dithering" over 1 encoder count. In some cases, positioning to a specific encoder count location may not occur due to table friction (stiction), screw accuracy grade, applied load, wind-up in a coupling, motor output torque, and tuning of a servo system among others. By using a well lubricated system, high accuracy grade screw, coupling with minimal wind-up, and a high resolution motor/drive controller will help ensure success. It should be noted that using a linear encoder does not always increase the positioning table accuracy to that of the linear encoder. Even though the linear encoder can compensate for the lead error of a screw, it cannot compensate for straightness, flatness, and angular errors of the table bearings and structure. Also, cosine errors (misalignment of encoder to direction of travel) and Abbe errors (offset distance between encoder read head & carriage top) will play a large factor on overall linear positioning accuracy.

Even though these linear encoders can operate at a maximum speed of 79 inches/sec (3 m/sec), installing them on a belt driven positioning table is not recommended. The motor/table to encoder 4:1 require resolution ratio is difficult to achieve due to the belt drive lead (3.5 inch/rev). This means that in most applications the motor controller will try to position to an encoder pulse that it never can reach, thus encoder "dithering". Even if it were possible to get to a 4:1 resolution ratio, the inaccuracies & stiction of the belt & pulley system could also cause encoder "dither".

Linear encoders with different resolutions, or special linear encoders for high temperature, vibration, and environmental challenging applications are available upon request.

Rotary encoders can be mounted to any screw or belt driven positioning table. These incremental encoders are provided in resolutions of 500, 1000 and 1270 lines/rev. The encoder precision etched glass disk is mounted to the screw, or belt & pulley, shaft extension and has a plastic protective cover. The shielded 10 foot (3 m) cable can easily be connected to most motion controllers or digital position displays. Positioning to a rotary encoder will compensate for errors in coupling & gearhead components. However, rotary encoders will not compensate for linear positioning errors within the screw & belt drive mechanisms. Rotary encoders are ideal for applications where an operator requires positional data via a digital display, or where detecting the stall of a carriage assembly is important.

See the individual table sections for linear & rotary encoder specifications, wiring information and mounting orientation.