Selecting an Incremental Encoder

Mechanical and environmental considerations are generally the most important factors in specifying an encoder. The following guidelines will assist the specifying engineer in selecting the correct encoder for the application.

Incremental or Absolute Output

The first step in specifying a rotary encoder is to determine the type of output required. Incremental encoders generate pulses that give direction, velocity and position information.

1. For direction sensing, quadrature outputs should be specified, i.e., two count channels displaced 90° electrically.
2. For velocity sensing, the output pulses can be detected and referenced to a time base.
3. For position sensing, the output pulses can be counted and referenced to a home base or zero reference point.

Absolute encoders generate a unique code word output for each resolvable position. For example, if an absolute encoder has a resolution of 512 (2^9) positions per resolution, it will produce 512 unique words in 360° of rotation. Thus, when powered up from a random position, the absolute encoder can immediately tell the processor the machine location. *(See pages 53-55 for Absolute Encoder selection.)*

Resolution

The angular or linear resolution required in an application will determine the encoder resolution or pulses per revolution.

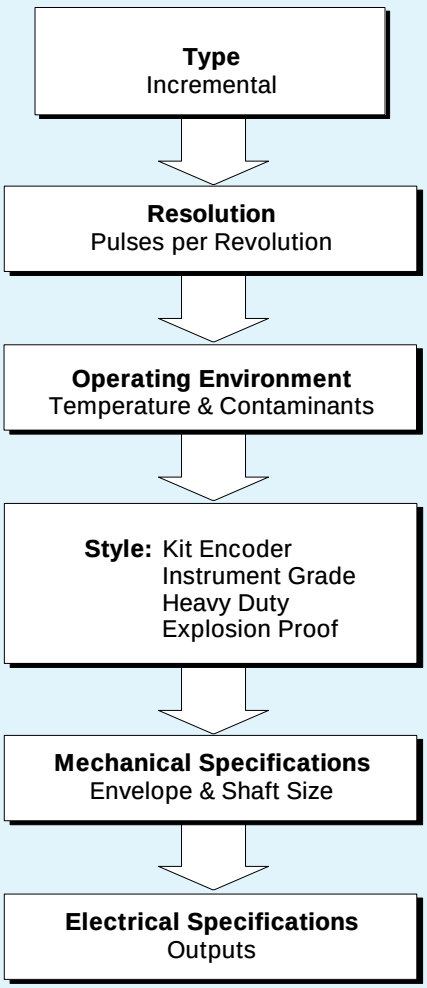
The encoder resolution is determined by the application. Linear resolution may have to be translated to angular resolution. For example, if the rotary encoder is attached to a ball screw with 5 revolutions per inch, and a linear resolution of 0.0001 inch is required, the encoder must have 2,000 pulses per revolution (ppr).

Environmental Considerations

Consideration should also be given to the encoder operating environment when selecting a rotary encoder. If an encoder is to be exposed to oil mist, dust or water, the proper housing integrity must be specified to prevent contamination. Three key areas must be considered.

1. Shaft seal or sealed bearing.
2. Housing seal—normally an "O" ring.
3. Electrical connector/cable integrity.

Selection Process



Operating Temperatures

Encoder performance can be degraded by operating outside the temperature range specified by the manufacturer. Typically, encoders are designed to operate from 0° C to 70° C. Lucas offers standard or optional designs that will operate in a temperature range of -20° to +85° C.

Shaft Loading

Shaft loading is critical to the performance and life of an encoder. If the shaft is overloaded, the output wave forms may degrade and encoder life will be reduced.

When the encoder selected has its own shaft, the axial and radial shaft loads must be determined. Typically, when the axial load exceeds 5 lb. and the radial load exceeds 5 lb. in., the selection of an encoder with a heavy-duty rating is required. These higher loads require larger shaft diameters and bearings to properly support the load.

If the encoder is mounted to the shaft (modular type), the axial shaft movement and radial shaft runout must not exceed the manufacturer's specifications. The axial and radial movement must be considered throughout the expected life.

Outputs

Standard incremental encoder outputs offered are typically TTL, open collector and line drivers. Selection considerations include the equipment with which the encoder is interfacing, the length of cable run, and noise immunity. For example, long cable runs in a factory environment often require line drivers, whereas TTL outputs are common to business equipment, which has very short cable lengths.

Lucas offers a full line of incremental encoders with just the right performance and features for your application. For engineering assistance in completing an evaluation and analysis of your requirements, call Lucas, Encoder Applications Engineering, at (513) 898-3621.