

Selecting an Absolute 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. 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 revolution, 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 10–15 for Incremental Encoder selection.)

Resolution

While absolute encoders generate a unique word output for each position, the process of determining the resolution required in the application is no different than the process used for an incremental encoder. An absolute encoder may be used to provide position feedback for a rotating head in a manufacturing operation or on a radar antenna. A resolution of 360 would provide positional information in 1° increments. An encoder with a resolution of 3600 would provide positional information in 0.1° increments.

Single-Turn or Multi-Turn

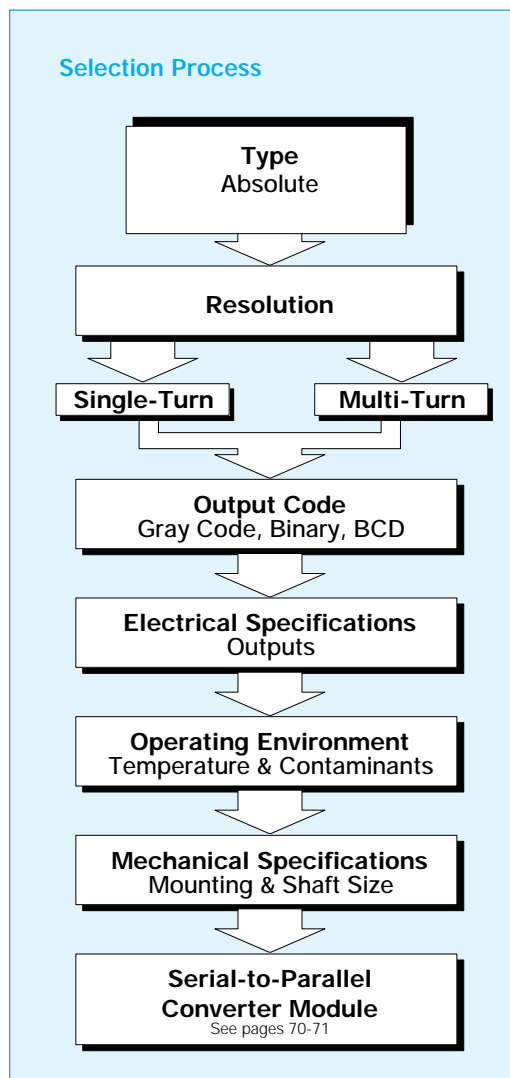
A single-turn encoder provides a unique word output for each resolvable position on the encoder disk over 360° of rotation. If the shaft continues to rotate and is providing linear positional information (for example, when attached to a ball screw which converts rotary to linear motion) after one full turn of the shaft, the linear position of the ball screw can be lost unless the shaft turns are counted. A multi-turn encoder essentially counts the shaft turns using gearing and a series of smaller absolute disks.

In addition to the unique word output for the angular shaft position, a unique word output also is generated to convey the number of shaft turns. If power is lost, at power up the encoder will immediately convey shaft turns and angular shaft position. For example, automated overhead gantry cranes can be controlled over long travel distances on rails by using a multi-turn absolute encoder to generate position feedback to the control.

Output Code

Ledex Absolute Encoders can be selected to provide Gray, Binary or BCD codes. Code selection is dependent upon the user's interfacing. All Ledex encoders generate Gray Code output which may then be converted to binary or BCD within the encoder or externally with a conversion module such as the SPA 2, which is used with the AAF100 Multi-Turn Encoder.

Selection Process



Outputs

Standard encoder outputs offered are open collector, line drivers, and single-ended buffered drivers. Selection considerations include the equipment with which the encoder is interfacing, the length of cable run, and noise immunity. Ledex single-turn absolute encoders are available with a single-ended, buffered driver or open collector output. The AAF100 multi-turn encoder offers a unique Synchronous Serial Interface

(SSI) output. The serial data output replaces the need for 21 parallel data outputs by using two data output lines and two clock lines. This reduces both the bulk and cost of the cable and makes it convenient to place cable for long transmission runs. EIA RS422 short circuit protected drivers are used resulting in high noise immunity. A conversion module, the SPA 2, is available for use with the AAF100 multi-turn encoder. The SPA 2 converts the serial transmission to parallel data where the interface module does not accept serial input. The SPA 2 can also be easily programmed to convert the AAF100 Gray Code output to binary or BCD. Tri-state outputs are also available from the SPA 2.

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. Ledex absolute encoders are designed with shaft, housing and connector seals to provide, at the minimum, IP65 or NEMA 4 protection.

Operating Temperatures

Encoder performance can be degraded by operating outside the temperature range specified by the manufacturer. Ledex absolute encoders are designed to operate over 0°C to +70°C.

Encoder Mounting

A variety of inch and metric mounts in face, flange, and servo types is available from Lucas. The most cost effective approach is to use standard shaft and mounting configurations shown in the catalog.

Face and flange mounts have a pilot diameter that can be used for centering or alignment of the encoder shaft with the driving shaft.

Servo mounts provide a convenient method for mounting and centering when it is difficult or impossible to secure or attach the face or flange mount due to space limitations.

Shaft Loading

Shaft loading is critical to the performance and life of an encoder. Exceeding the rated axial and/or radial shaft loading can degrade the output wave forms and encoder life will be reduced. The use of a flexible shaft coupling is always recommended to accommodate minor shaft misalignments and to assure that the maximum rated encoder shaft loading is not exceeded.