

Encoder Quality

Industrial Encoders are available for use over a wide range of environmental conditions. A large variety of designs allows the user to customize an encoder to his requirements. This also allows the specifying engineer to select only the options needed without incurring unnecessary additional costs.

There are a number of factors that must be considered to ensure reliable, consistent encoder operation in industrial applications.

In particular, the encoder must have a high degree of mechanical and electrical stability. In order to achieve this stability the encoder must have a solid foundation. The encoder disc, shaft and bearings must be of the highest quality to assure the ultimate accuracy of the device.

The encoder disc interrupts the light as the encoder shaft is rotated, and it is the code pattern etched on the disc which is primarily responsible for the accuracy of the electrical signal generated by the encoder. Should the disc pattern be inaccurate, the resulting signal will reflect that inaccuracy.

BEI has developed some of the most sophisticated, and accurate divided circle machines in the world. These machines are capable of accuracies in the sub arc second range. Originally intended for the military and aerospace industries, this quality is automatically incorporated into the industrial products.

The shaft and bearings maintain accurate rotation of the disc and help to eliminate such errors as wobble and eccentricity which would be translated into position errors. The encoder disc must be carefully mounted to avoid eccentricity as the pattern is read. Such eccentricity can cause inaccuracies in the encoder output that will not be apparent to the user during electrical testing but will cause false position information.

In order to eliminate eccentricity errors, BEI has developed electronic centering fixtures capable of centering accuracies up to 40 millionths of an inch.

When selecting an optical encoder for the industrial environment, the following areas may be considered:



Encoders intended for use in harsh or hazardous environments can be subjected to many optional tests to ensure they will perform as specified.

Heavy Loads

In applications utilizing gears or drive belts, excessive radial (side) loading on the shaft can shorten bearing life. Encoders should be specified in accordance with the anticipated side loading. Typical maximum loads for industrial encoders are 5, 40, and 100 lbs. Ultra heavy duty encoders are available to withstand heavier loads as well as shocks of up to 200g's.

Corrosive or Washdown

Aluminum encoder housings with a chemical film coating (ex: Iridite or Alodine) finish are sufficient for most applications. However, if the encoder is intended for operation in a corrosive environment, a hard anodize finish with a dichromate seal should be considered. For food or medical grade applications where a washdown may occur, an electroless nickel coating or even stainless steel construction may be required.

Temperature Extremes

The temperature specification of the selected encoder must be consistent with the application. Zero to 70 degrees Celsius is the standard operating temperature on BEI's industrial encoders. Extended temperature testing from -55 to +105 degrees Celsius is available, depending on the model.

Hazardous Environments

Your application may require a special certification, such as explosion proof. Testing for this certification determines that if certain flammable gases infiltrate the encoder housing and are ignited by the internal electronics, the resulting flame or explosion is not able to escape from the housing and ignite the surrounding atmosphere. Specially designed encoders are available that meet the appropriate specification. For “Intrinsically Safe” and “Explosion Proof” ratings, refer to Hazardous Area Usage on pages 47-49.



Industrial environments can really test the integrity of a mechanical design. The encoders shown here have just undergone a leak test in order to ensure that they are properly sealed against wet environments.

Wet or Dirty Environments

If your application requires operation in a liquid or dusty environment, the encoder must be selected accordingly. Adequate sealing is a “must” to ensure against contamination, particularly through the spindle assembly. Contaminants that infiltrate the shaft bearing can rapidly degrade encoder performance. In the encoder interior they can disrupt the optical components or damage the circuit board. A shaft seal is recommended in general, and must be used in applications where liquids are present. If liquid exposure is anticipated, you can specify a leak test.



Precision alignment of sensor arrays is done under high power. Close attention to critical components means robust operation for the finished product.

Electrically Noisy Environments

The increasing use of factory automation systems means industrial environments are rich in electrical signals that can create Electromagnetic Interference (EMI). Some protection can be afforded by shielded cable, especially in conjunction with the use of twisted pair conductors. When this type of cable is used with an encoder, its complements, and a differential line receiver, a significant improvement in noise immunity can be realized.

SPECIAL NOTES

INSTALLATION: Even with the appropriate package, shaft, bearings, and disc, the user must exercise care to avoid undue shock and abuse. In particular, the bearings or code disc can be damaged if the encoder is dropped or a pulley is hammered on the shaft. The typical shock and vibration specification for an industrial encoder is a 50g shock for 11 msec, as well as a vibration of 20g's from 2 to 2000 Hz.

MECHANICAL PROTECTION: To adequately protect the optical and electronic components from exposure to the environment, encoder case thickness should be consistent with the severity of expected abuse. In applications where the housing may be struck by tools or debris, a cast housing or protective shroud should be used.

Questions?

Call 1-800-ENCODER and ask for “Applications Assistance”