



## Accuracy of Encoders

### What is accuracy of an encoder?

Accuracy is defined as how close an actual pulse is to the theoretical perfect position. Many applications require encoders with a high degree of accuracy to function well. With poor accuracy, measurements can be erratic, motion control is more difficult and position control is sloppy. Figure 1 shows expected positions of an accurate 12 PPR encoder. Much like the face of a clock, each position is equally spaced throughout the full revolution, the more equally spaced, the more accurate.

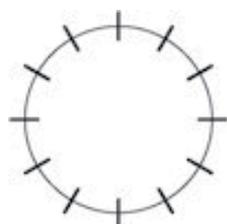


Figure 1

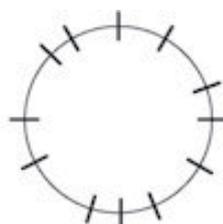


Figure 2

In Figure 2 the positions are not equally spaced on this less accurate encoder. An application using this encoder will have difficulties accurately measuring position, velocity, or acceleration.

### What determines accuracy?

A number of factors determine the accuracy of an encoder. The accuracy of the disc master, quality of the bearings, stability of the rotating assembly, concentricity of the disc pattern to the true center, and the design of the optics are among the most important factors. The concentricity of the disc and its pattern relative to true center of the encoder shaft is one of the biggest contributing factors in determining overall accuracy. Additionally, mounting the encoder concentric relative to the motor or drive shaft affects accuracy, making the flex mount or coupling design and installation an important consideration.

### What does the accuracy specification mean?

Because accuracy is typically defined as degrees or arc-minutes from a true mechanical position, or from one cycle to another cycle, the lower the number the better. For example, an encoder may have an accuracy specification of  $0.01^\circ$  or 0.6 arc-minutes, less accurate encoders will have their accuracy stated as  $0.04^\circ$  or 2.5 arc-minutes.



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## Accuracy of Encoders cont.

### Now that I understand accuracy, what is Resolution?

Resolution is defined as the total number of increments produced during one encoder revolution. For incremental encoders, resolution is defined as Pulses Per Revolution (PPR). An encoder may have high resolution, however this does not always guarantee high accuracy. For instance, a low resolution 256 PPR encoder can be very accurate, while a high resolution 10,000 PPR encoder may be very inaccurate if the manufacturer did not adhere to the necessary steps required to produce highly accurate encoders. As a rule, there is some improvement in accuracy from a very low resolution encoder, example 50 PPR, to a higher resolution encoder, such as 1000 or 2000 PPR. This is usually due to the averaging effect where more lines are in the active sensor area at one time and the finer switching points associated with the higher PPR.

### Why are BEPC Encoders so accurate?

Superior designs, proprietary assembly processes, and top quality components, have earned British Encoder Products Company the reputation for accurate encoders. Using a custom built accuracy testing machine, sample encoders are compared to an extremely accurate 7,200,000 PPR reference. As the sample encoder rotates, each position compares to the theoretical perfect position reference.

Regardless of your application, you can be assured of a highly accurate quality encoder from British Encoder Products Company.