Designing for Magnetostrictive Linear Position Sensors

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Today’s high-performance equipment calls for innovative components designed specifically to meet their market demands. The developments in linear-position sensors have proven to be an effective means for increasing productivity, quality assurance, and profitability in many industrial applications. Magnetostrictive linear-position sensors, in particular, have gained popularity due to their inherent accuracy, reliability and ability to provide continuous, absolute positioning.

When designing with a magnetostrictive linear position feedback device, proper attention must be paid to match the sensor with the application requirements for signal output, housing style, measurement length, and environmental conditions.

Signal Output
Signal output comes in a variety of options to communicate with a wide range of controllers. Analog output can be specified as Current, such as 0 to 20mA, or Voltage, such as 0 to 10V. Common fieldbus interfaces for multi-device controllers include Profibus, CANbus and Devicenet. Industrial Ethernet protocols such as EtherCAT and POWERLINK are also growing in popularity and Synchronous Serial Interface (SSI) is often used in applications that require high-speed, synchronized measurement updates. The signal interface selection is typically a function of the controller used in the application with considerations made for the required measurement cycle time. Some interfaces, such as SSI and EtherCAT are capable of reporting an absolute position measurement every 100 microseconds (10 KHz).

Housing Style
Magnetostrictive linear-position sensors are available in several configurations to enable mounting in a wide range of applications. Hydraulic or pneumatic cylinder-mount options have rod-and-flange designs which are capable of maintaining the cylinders’ high pressure seal even when replacing a sensor unit. Installation of the hydraulic-style sensor is accomplished by threading the unit into a cylinder that has been prepped with a hollow piston rod and an industry-standard threaded port in the end cap.

Another popular way to mount a linear-position sensor is by bolting its base to the machine frame using a profile-style housing. The position magnet can be mechanically linked to a moving machine part using a ball-joint or other connector and travels in parallel to the sensor axis in a sliding or free-floating carrier. Since there is no contact between the magnet and the sensing element, there is no mechanical wear.

Detached electronics are available for tight spaces or when the electronics need to be remote from harsh environment conditions. A rod-and-cylinder style package is also available with a clevis on the rod end and optionally on the opposite end of the housing as well. The magnet may also be embedded inside a float for liquid level applications.

Sensor Length and Stroke Length
The active stroke length is defined as the region along the sensor axis in which measurements are reported. Every sensor model has a null and dead zone which corresponds to the unusable physical length at each end of the sensor. The active stroke length for magnetostrictive sensors can range from 1 inch to over 400 inches depending on the sensor model. For very long stroke applications (over 300 inches) a flexible, coil-able sensor is available that makes shipment and installation easier.

Environmental Conditions
Magnetostriction is one of the most robust measurement technologies and is therefore used in many harsh applications with high shock and vibration levels. In addition, a variety of protective housings, such as explosion-proof or IP69K, are available for applications in hazardous environments or that require high pressure washdown.

These are just some of the key factors to consider when selecting a linear position sensor. Working with an applications engineer at the sensor supplier can help ensure proper selection and optimal machine performance for the given requirements.