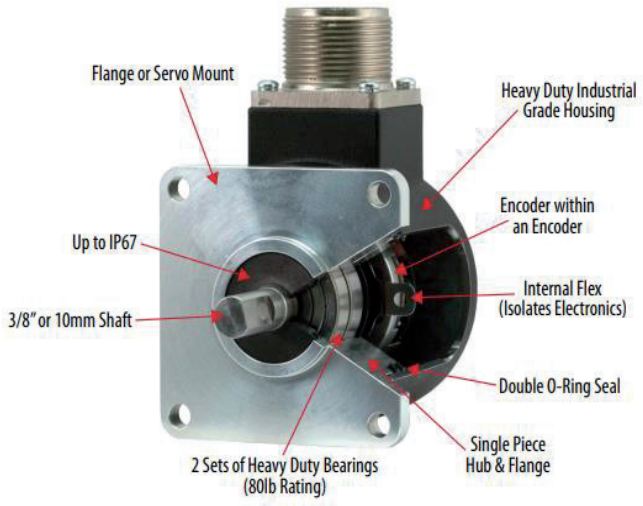
White Paper 2006
Encoders in Inhospitable Environments

BRITISH ENCODER PRODUCTS COMPANY

Encoders are often used in harsh industrial environments. Encoders can be exposed to the same contaminants other machinery is, including high volumes of dust, an abundance of moisture, caustic chemicals, even physical damage, where the encoder is knocked around by other equipment. For encoders used in an outdoor environment, they must be able to stand up to extreme weather conditions. In short, encoders need to be able to endure whatever the machinery they're a part of can endure.

In applications that call for frequent washdowns with caustic chemicals, the chemicals can attack the encoder's aluminum housing and exposed parts, which causes corrosion and eventually shortens the life of the encoder.



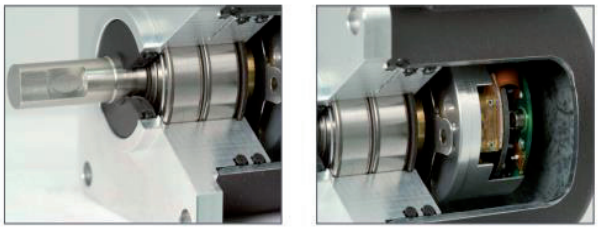
Model 725i industrial housing

Housing Options

For protection against corrosion of the housing, shafts, connectors, etc., encoder housings should be made of 6061-T6 or 6063-T6 aluminum with a tough powder-coated finish. This combination provides a rugged unit that is protected against most industrial environments. A stainless steel housing on an encoder will provide an additional level of corrosion protection where needed.

Isolation Options

For extremely harsh environments, an encoder isolated from the corrosive elements is often the best long-term choice. One method of isolation is to place the encoder in a sealed and corrosionproof enclosure. However, this can be an expensive alternative, and often it makes the unit too large to fit into its application.


Cutaway views of Model 725i

A more economical solution is to use a flexible drive shaft and place the encoder in a remote location, out of the corrosive environment. These flexible drive shafts are similar to the speedometer drive cable used in automobiles. They transmit rotary motion around curves, obstacles, etc. The portion of the flexible drive shaft that is exposed to the hostile environment can usually be replaced quicker and more economically than the encoder.

Some of these flexible drive shafts can be obtained with conformal coatings, which will enhance their life in harsh environments. Or it is usually a simple matter to coat the outer sheath with some type of corrosion resistant compound, such as heavy grease or Cosmoline* coating. There are many different configurations of flexible drive shafts available, and they are available in any reasonable length. There are a number of manufacturers that carry a complete line of flexible drive shafts, and can provide custom designs for any application.

Flexible Shafts

A few known examples of where these flexible shafts have been used with encoders are in the nuclear industry where the position of valves, rods, etc., in a radioactive environment existed. The radiation would shorten the life of the solid state electronic components of the encoder. By placing the encoder external to the machine environment, the problem was solved.

Flexible shaft-mounted Model 702 installed on agricultural harvesting equipment

Another example is a food processing plant where the machinery has to be completely washed down every shift or every few hours. Stainless steel plumbing was used throughout the plant and it was considered “routine maintenance” to completely replace all the plumbing and associated equipment every six months as a matter of course. Naturally, the encoders were replaced along with all the rest of the equipment. When this customer went to the flexible shaft drive to the encoder, he found out that over a period of three years, the encoder was the ONLY item in the plant that was still original. Thousands of dollars were spent replacing stainless steel drive motors, pumps, plumbing, etc., but the encoders were still performing like new.

Torsional windup is one concern when implementing flexible drive shafts. With the proper flexible drive shaft (configuration, length, etc.), and correct installation (proper bend radius, sealing), windup can be greatly reduced. The migration of liquids inside the inner sheath of the flexible cable can also cause problems. Proper sealing methods on each end of the cable solve this issue. Remember that liquids flow downhill, so be sure to provide a drain loop at the end of the cable, or have the encoder elevated above the rest of the machine.

Conclusion

If you still have questions about output, or anything else encoder-related, contact BEPC. When you call us, you talk to engineers and encoder experts who can answer your toughest encoder questions.