Position Measurement & Control - September 2002 (S050F)

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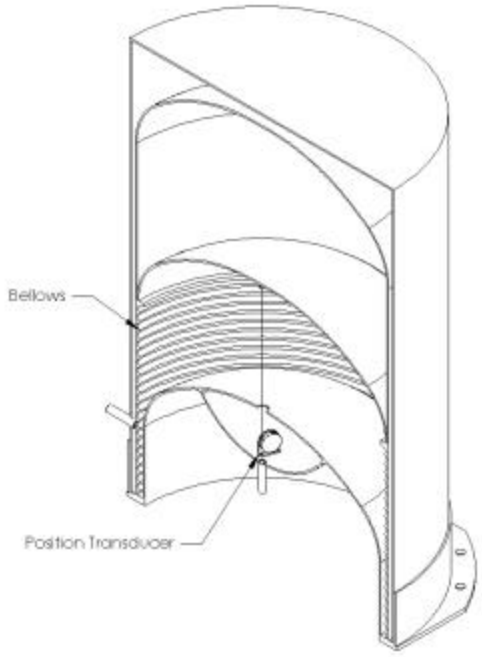
APPLICATION FOCUS

Bellows Displacement Monitoring

Tight Spots and Cable-Type Displacement Sensors Are A Natural Fit

Cable-type displacement transducers are the sensor of choice for many bellows displacment monitoring applications. Their small size, flexible mounting, and short length relative to maximum displacement are all reasons these products are specified repeatedly for this measurement challenge.



Bellows position measurement can be made easy with cable-type displacement sensors.

What is a bellows? Generally, a bellows is a ribbed structure that can be displaced. An accordian is an example of an item that incorporates a bellows. More specfically, a bellows is an apparatus for controlling a pressurized environment. It is a chamber that is contracted and expanded by pumping to force a gas through a nozzle.

Bellows are used for many purposes due to their small size, reliable operation, and lightweight. In many applications it is important to monitor the displacement of the bellows to act as a control mechanism. Key criteria for any sensor to considered for a bellows measurement task is compact size, low weight, and easy installation.

SpaceAge Control cable-type displacement sensors are ideal for this type of application due to the use of a flexible cable that gets wound around a threaded drum. This design reduces the "footprint" of the sensor and the mass. The flexible cable also is easily mounted using threaded studs, swaged balls, pins, or other secure techniques.

Please contact us if you would like to learn more about simple and reliable bellows displacement measurement.

APPLICATION CORNER

The Application Corner answers your questions about using position transducers in specific applications. If you have an application question you would like answered, please contact us by phone, fax, e-mail, or Web form.

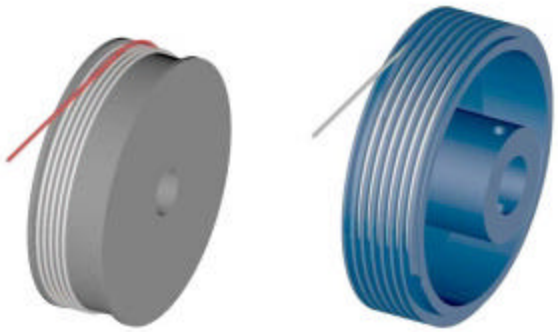
Repeatability Benefit of Threaded Drums

Q. What is the repeatability benefit of the threaded drum?

A. The repeatability benefit of the threaded drum is that it ensures the displacement cable wraps onto the drum in the same location each cycle. Non-threaded drums can allow the cable to wrap up on itself, may have gap variability between each revolution of the cable, and have cable placement inconsistency from cycle to cycle.

Quantitatively, let's take the example of the displacement cable wrapping over itself on a non-threaded drum for only one revolution and then not wrapping up on itself. Using a 2-inch (50.8 mm) diameter drum as an example and a 0.027" (0.6858 mm) diameter displacement cable, the threaded drum will provide an output of 6.326" (160.67 mm). If, however, a non-threaded drum is used and the cable wraps up on itself for only one revolution, the circuference on that revolution will be 6.368" (161.747 mm). This cable overlap adds a repeatability error of ±0.335% for the non-threaded drum solution.

Note that all standard SpaceAge Control position transducers use threaded or grooved drums for enhanced repeatability.



Non-threaded drums can introduce repeatability errors on draw wire-type displacement sensors.
In the figure above, the overlapped cable (red section) will change the output and affect accuracy.

Displacement Cable Connection Via Magnet

Q. Do you have any sources for magnets for connecting the displacement cable to my application?

A. There are a number of sources for magnets with hooks, threaded studs, and other connection features. A good search engine will likely turn up a lot of possibilities. Sources you may want to consider include:

- http://www.hangups.com/09.html

- http://www.magnetsource.com/
- http://www.magnetweb.com/

Quadrature Output

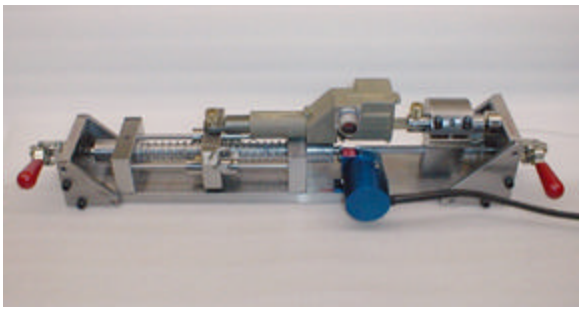
Q. What is quadrature output?

A. Quadrature output refers to the 90-electrical-degree phase relationship between the A and B channels of incremental encoder output. For more information on quadrature output terminology, visit US Digital's Glossary or Gurley's Glossary

IN ACTION

Every month we see numerous fascinating applications of our position transducers. Here are a few recent ones:

Actuator Final Assembly Fixture Monitoring High-resolution Series D60 position transducers are used to monitor flight control surface actuator output during final assembly and test. The Series D60 was selected due to its high repeatability, high resolution, and easy installation.



SpaceAge Control D60 digital output dispacement sensor monitors actuator final assembly fixture.

Window Acceptance Testing Spadix Technologies, Inc. uses Series 160 products to test its automated robotic window manufacturing equipment.

Korea Aerospace Industries (KAI) T-50 On August 20, 2002, the Korea Aerospace Industries (KAI) T-50 advanced trainer took to the skies on its first flight. On board was the 100700-03 air data boom incorporating 4 air flow vanes, heated probe, and TAT sensor. Future flights will be conducted with a suite of SpaceAge Control miniature position transducers. The T-50 advanced supersonic trainer will have the maneuverability, endurance, and modern systems to prepare future pilots to fly current and next-generation fighters such as the F-16, F-15, F-22 and the F-35 Joint Strike Fighter.

KAI's T-50 next generation jet trainer lifts off for the first time with the nose-mounted 4-vane 100700-03 air data boom.

Eclipse Aviation 500 The Eclipse 500 had its first flight just days after the T-50 on August 26, 2002. On board was the 100510-02 swivel head air data boom with a unique wing-mounted installation. The Eclipse 500 is a luxurious six-place, twin-turbofan aircraft that costs less than most used turbo-props. Future Eclipse 500 flight testing will incorporate the use of SpaceAge Control displacement transducers for tracking flight control movement.

The Eclipse 500 shown with the 100510-02 air data boom mounted on the right wing tip.

NEWS YOU CAN USE

Poll Update

Our current poll question is "What type of electrical termination do you prefer?". To vote, go to the upper left-hand column of any page on our Web site (including this one).

You can also view the results of the last poll ("What displacement range do you most frequently measure?").

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