Position Measurement & Control - October 2002 (S050G)

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APPLICATION FOCUS

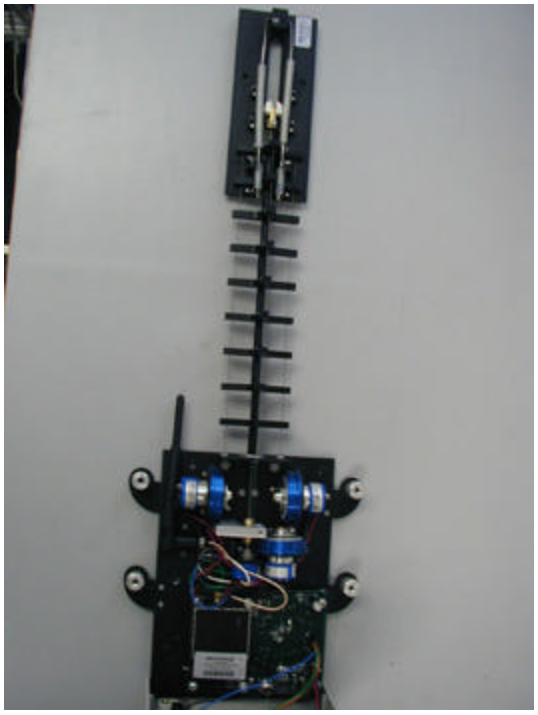
BIOMEC's AcuPath(tm) Knows What Type Of Load You Are Under

Motion Analysis Tool Helps Reduce Lower Back Disorders

The AcuPath(tm) Industrial Lumbar Motion Monitor(tm) (or iLMM(tm)) device records and provides information about the physical motions required to carryout specific job functions. Produced by BIOMEC, a leading biomedical product development and manufacturing company, the iLMM(tm) consists of an exoskeleton of the spine incorporating four potentiometers that measure thoracolumbar lumbar motion in three dimensions.

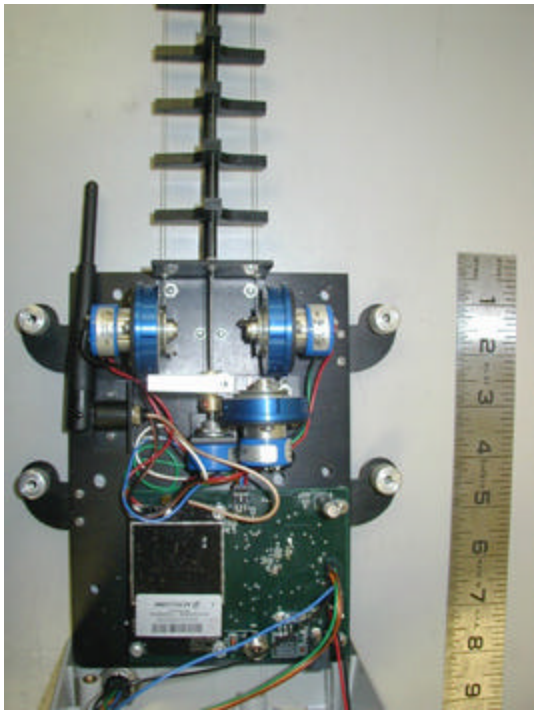
The AcuPath(tm) lumbar motion monitor in action.

The device has two plates separated by a series of metallic vertebrae that are held in place by a central rod, spacers, and peripheral cables. The three cables are anchored to the top plate, and their other ends are attached to spring loaded pulleys on the bottom plate. SpaceAge Control OEM displacement sensors attached to the pulleys measure flexion of the device and hence motion of the spine in the sagittal and transverse planes. The center rod is attached to a fourth potentiometer in the bottom plate and measures torsion of the device, and hence twisting motion of the spine.



Frame of device showing 3 displacement sensors mounted.

This device is used by ergonomists and safety engineers to prevent work-related back injuries by determining how much exposure to adverse work conditions (bending, lifting, twisting, etc.) is too much, i.e. likely to cause low back injuries in the workplace. The company has begun work to develop a similar product for use in clinical applications for patients who have already sustained a low back injury.



Scale indicates the small size of AcuPath(tm) and the displacement sensors.

Explaining why BIOMEC selected SpaceAge Control sensors, Geoff Kotzar of BIOMEC stated, "In this application, we needed a displacement sensor that 1) provided constant tension, 2) didn't slip, 3) was

durable, 4) had relatively low profile, and 5) was accurate. The SpaceAge Control product met all of these requirements."

For more information on AcuPath(tm), visit http://www.biomec.com/downloads/acupath.pdf. To contact BIOMEC, go to http://www.biomec.com/contact/.

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.

Potentiometer and Encoder Standards

Q. Where can I go to learn more about potentiometers and encoders?

A. Try these sources:

- Potentiometer Industry Standards
- Encoder Industry Standards
- Encoder Technical Articles
- Encoder FAQs

Installation Guide

Q. I lost the Position Transducer Installation Guide sent with my position transducers. Can you send me a duplicate?

A. This document is available in PDF format online. Please contact us for a mailed hardcopy version.

Thread and Helix

Q. How do I calculate the displacement cable travel that will occur during one revolution of your multi-turn position transducers?

A. Our standard multi-turn displacement transducers use a threaded drum for improved repeatability. You may have an application where you need to know the precise travel measured during one complete revolution of the displacement transducer's cable drum. This information may be useful, say, when an optical encoder is used as the sensing element instead of a precision potentiometer.

Because a thread is a helix, the formula for determining the distance travelled during n revolutions of the cable drum is:

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s = n*square root((2*pi*r)2 + h2)
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where

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s = distance travelled
n = number of drum revolutions
r = radius of drum
h = pitch in linear units
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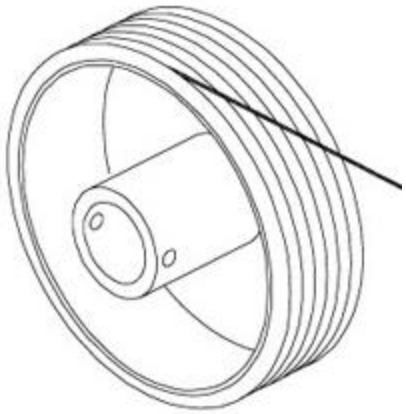
Note that Series 16X products do not use gear reduction and, hence, there is no backlash or creep. Call us if you need cable drum dimensions to perform this calculation for your application.



IN ACTION

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

Adam Aircraft A500 On July 11, 2002, the Adam Aircraft A500 had its first flight. Mounted on the left wing was the 100600 air data boom. Internally, several position transducers monitored the position of flight control surfaces. Adam Aircraft Industries is revolutionizing aircraft manufacturing by bringing to market the A500, a six-place, pressurized, center-line thrust, carbon composite aircraft.

The A500 on it first flight with SpaceAge Control air data and displacement measurement sensors aboard.

Series 160 Takes 200 MPH (322 KM/H) Crash, 80 g's, and Fire -- Keeps Ticking Morgan-McClure Motorsports uses the Series 160 position transducer to monitor driver and suspension controls on its NASCAR vehicle. Recently, the vehicle's front tire blew out at the Kansas Speedway causing the vehicle to impact the retaining wall at an estimated 200 mph (322 km/h) speed. This impact resulted in an 80 g load to the position transducer along with severe heat due to a subsequent engine fire.

After the accident investigation, Morgan-McClure Motorsports returned the unit to SpaceAge Control for repair. An acceptance test of the item at SpaceAge Control showed the unit had suffered no damage and was fully operational.

The vehicle in post-crash, post-fire condition

Location of the position transducer mounted on the vehicle

It survived: The Series 160 sensor was battered and burned but passed all acceptance testing after the crash.

NEWS YOU CAN USE

Position Transducer FAQs

Have a question not answered in our installation manual and data sheets? If so, you may want to visit our Position Transducer FAQs page:

- http://www.spaceagecontrol.com/ptfaqs.htm

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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