TechniTalk

Autumn/Winter 2008

Welcome to the Techni Measure Newsletter

Whether you are reading this for the first time or have been following our series of publications, we hope that our fourteenthedition of **Techni*Talk***,continues to inform readers of new products, whilst providing technical suggestions on howor where these products might be used.

Orientation Applications

Since the introduction of the MicroStrain range of products nearly three years ago, the measurement of orientation has become a growingarea of business for Techni Measure. Typical applications for these sensors include unmanned vehicles and robotic navigation, platform stabilisation, biomechanics applications, and general attitude sensing.

For precise spatial position sensing, three orthogonal accelerometers (X, Y & Z) are used along with gyroscopic stabilisation. The MicroStrain 3DM-GX1 and GX2 sensors for instance, not only combine the outputs of three orthogonal accelerometers with three orthogonal gyroscopes, but they also have three magnetometers in order to produce, with the help of embedded algorithms, a full orientation matrix. For example, real time pitch, roll and yaw can be measured onamoving vehicle, with effects of vibration being minimised. If you have any application where you need to measure simple inclination or more complicated spatial orientation, please ask us for our advice on the most suitable type of product.

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IssueNo.14

Measurement and Control products for all industrial and scientific applications...

Product News

Strain Transducer

Techni Measure is pleased to introduce the re-usable strain sensorfrom Scaime. The Epsimetal V isaninteresting extension to their wide range of load cells, and has a full-scale range of +- 500 microstrain. With built in electronics, this sensor provides a standard calibrated output of 5mV/microstrain.

It can befixed by bolting direct ontoa structure, or via flat orcurved adhesive mounting plates. The suppliedM2.5 mounting bolts are built in to avoid losing them on removal from the structure. Although the standard output signal is an analogue voltage, there are options for alarm level outputs, 4-20mA and RS-232.The sensor comes with a 6m integral cable and is temperature compensated for steel between -10 degC and + 50degC,however special compensations can be suppliedfor other materials. The Epsimetal is 47mm long and16.6mm wide with a height of 16mm and weight of 30g excluding cable. Environmental protection is to IP54. Full mounting kits can be supplied if required. Typical applications for this device include tie rodloading for mouldingmachines, generalmachine frame monitoring, crack monitoring, and overload warning for load operations. Fullmounting and monitoring kits for tie rod balancing can alsobe supplied.

We would be please to discuss any application where strain measurement on machines can be used to monitor load,and ofcourse we can also recommend any ofour large range of adhesive mount foil strain gauges if moreappropriate.

Subminiature Accelerometers

Dytran Instruments have released a newultra-miniature accelerometer that weighs just 0.2 grams. This sensor is ideally suited in applications where the additional mass of the monitoring device could affect the test conditions.

Even though the 3224A2 sensoris tiny, ithas a robust construction with a welded titanium housing. The sensor is ideal for tests involving environmental stress screening, printed circuit boardvibration measurements, mechanical shock applications or general purpose vibration monitoringwhere space or weight is at a premium.Thedevice has integral IEPE electronic circuitry providing a sensitivity of 2mV/g, and can operate at temperatures from-50 degCto +148 degC. It is designed for adhesive mountingand offers a frequency responseupto 10kHz. It uses a quartz sensing element in a planar shear mode that helps to reduce base strain effects, thermal transient response and thermal coefficient sensitivity. The integral lightweight cable isalmost 1m long and terminates in a 10-32 connector for easy lead wire extension. The model 3224A1 looks physically identical but has a ceramic sensing element instead, giving a more sensitive 10mV/g output and a higher frequency range of20kHz.

Thesesensors are currently the smallest in the Dytran range of miniature accelerometers and with new miniature sensors like this being designed all the time, we would be very pleased to discuss any application that you may have for low weight vibration measurements.

Gap Sensors

Capacitec continue to design new wand sensors for their gap measuring systems. The GP or HP wandsareflatcapacitance sensors designed for measuring gaps from as small as 0.2mm up to 6mmor more.

These wand probes are often custom designed to meet customer specificationsin terms of size, shape, and sensing gap. Wands can be made one sided which are then usually stuck down to one side of the gap, orasa double sided sensor to enable both surfaces to be detected atthesame time whilst being held within the gap. Various surfaces can be detected, providing they are conductive and can therefore begrounded in some way. The surfaces can be flat, curvedorevenUshaped,butforeachapplication a special calibration would need to becarried out in order to gainthebest accuracy. Capacitec have a hand held system called the Gapman, that gives a push button displayof the gap, as well as simple RS232 interface communication for computer storage and qualitysystems. Other more sophisticatedsystems for displaying or analysing the results arealso available. Applicationsfor this technology include aircraft assembly gaps, roller gaps,slot die coating gaps, photocopier and printer gaps, photographic coating gaps, turbine blade gaps and many more.

Please let us know ifyou requireanyfurtherdetails on these gap-measuring sensors, or tell us what special requirements you may have. These systems haveproved many times tobetheanswer,whenallelse has failed.

Dytran New Product Guide...

Call us on01527 854103 to receive your FREE copy of Dytran's new Product Guide that includes brief details on many newproducts in theirrangeofPiezoelectric Transducers.

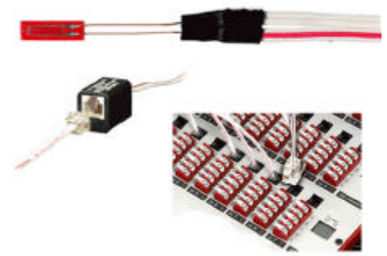
Inductive Slot Sensor

A unique product in the Schreiber Messtechnik range of inductive displacement sensors, is their model SM48slotsensor. Insteadof the standardofferingof extending shaft sensors, these devices measurethe positionofathin vane passing through a slot in the sensor.

The unit has two coil systems facing each other inananodised aluminium housing,separated byanair gap. The supplied vane changes the magneticcoupling of the two coil systems,and the builtinelectronics convertsthis variation into an output signal proportional to the movement of the vane. The displacement range is up to 20mm with anaccuracy of better than 0.5% full scale.Three output options of 0-20mA, 4-20mA or +-10V are available. The sensor is 80mm long, 60mm wide and 26.5mm high andeither IP66 protection or IP40 areavailable depending on the cable connector used.Frequency responseis up to 800Hz. Obvious applications for this design would be accuratesmall angularposition sensing,but itcouldalso be employed in linear travel measurement where a standard shaft design sensor would not be appropriate.

Please ask for details of this novel sensor, and if you have any questions regarding the measurement of displacement in general we would be pleased to visit you to discuss any possible application.

4-wire Strain Gauges



TML have introduced a new 4-wire single strain gauge system that solves the problem of temperature changes due to lead wires, and also any contact resistance effects when connectingup the gauge to instrumentationorin-line connections. This enables long thin cables to be used with low cost connectors.

Traditionally, 3-wire leads have been used to helpreduce temperature effects on the lead wire, however some measurement errorsstill occur owing togaugefactor changes due to lead wireresistanceandvariation in contact resistance. For3element rosette straingauges the number of lead wires using this new technology can be reduced to 6 due to the use of shared gauge leads to complete the 4-wire connection.Thebasic electrical circuit is a simpleseries circuit consisting of the gauge resistance and a reference resistance, where with a constant current, thestrain is found from a ratio of the voltage generated across the gauge, to the voltage across the reference resistance. TMLhave developed a few new instruments to accept thesenew gauges, with the added optionofemployinglow cost RJ12 connectors.

Please ask for further details on this new series of strain gauges, or for any advice you may needfor any strain gaugemeasurements. We have theproducts andexpertise to solve most applications.

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Who's Who ?

TML in Japan, are celebrating their 50th anniversary soon and asked Techni Measure if they could supply a photo of the current employees in front of Alexandra Buildings. Instead we supplied them with an edited picture of our staff superimposed on a picture of our building, with a picture of founders Frank and Betty Ramage looking down. From left to right are Patricia, Ian, Felicity, Peter R, Sue, John, Peter F. and Steve. Techni Measure will be celebrating their 40th anniversary in a few years time, and we will soon be searching for customers who were with us way back in 1971, to hopefully appear in a special edition Newsletter.

Techni Measure on Show...

A list of exhibitions planned so far for 2009 follows, where we would be pleased to meet with anyone to discuss possible applications for our wide range of products. If you need tickets or further information then please let us know.

11-12th February

MANUFACTURING SOUTH at Farnborough.

24th February

EIS INSTRUMENTATION at Silverstone.

25-26th March

MTEC at Birmingham.

9th September

EMEX at Cambridge.

7-8th October

INSTRUMENTATION SOUTH at Reading.

Please remember that if it is not possible to attend any of these shows and you need a demonstration or explanation of any of our products, we will always be pleased to visit you instead.

Tech Note

What is ... a Load Cell ?

A load cell is basically a transducer that converts a load into an electrical signal. Most loads cells are strain gauge based, however there are some other alternatives. In most modern applications that involve weighing, a load cell using strain gauges of some sort can be found, configured in a Wheatstone bridge, and with an output sensitivity usually specified as mV/V.

Strain gauges used can be resistive foil, semiconductor (piezoresistive), or thick film, but all basically operate in a similar way and require some part of the sensor structure to bend or compress under load, to produce strain. This means that there will always be a certain amount of compliance in the system that will affect the resonance to some degree. Depending on the design, strain gauge load cells are generally not very good at measuring fast changing loads or impacts.

Bending beam *Shear beam*

There are several designs of load cell, each of which offer the best configuration for a particular application. The Bending beam load cell (single point) for instance is relatively simple and therefore generally low cost but it does not tolerate side loading very well. The Shear beam load cells look very similar but the gauges are applied on an I-beam construction to measure shear strain when load is applied. The shear beam load cell handles side loads and dynamic forces better than the bending beam types. S-type load cells are commonly used in lower load in-line tension/compression applications, whereas the column type load cells offer much higher load measuring capability. Centre hole designs and button type load cells are also available, mainly for compression loads. Any reputable supplier of load cells should be able to suggest the best design for any given application.

One limitation in common with all load cells is the measurement range. The part of the cell under strain is designed to produce the highest practical strain for a given load, so that unless physically protected, large overloads can cause the structure to go beyond the yield point or even break. For this reason it is common to choose a load cell which has a specified range of about twice the required measurement. This is particularly advisable for cyclic dynamic loading.

For fast changing loads or impacts, the most common sensing element is the piezoelectric crystal. These types of sensors are usually called force sensors since they are calibrated in units of force (Newtons or lbf). A Newton is the SI unit of force that would give a mass of 1 kg, an acceleration of 1m/sec/sec. The piezoelectric effect is present in a few crystal structures but the most commonly used in force sensors is quartz. When subjected to a force, quartz will generate a charge on the surface, which can be measured to give a direct electrical output, or conditioned to give a voltage output proportional to the force (eg. mV/N). The quartz crystal is very rigid and therefore has a high natural frequency, but if a steady force is maintained then the charge starts to decay. Consequently these sensors are only generally used for dynamic force measurements or impacts.

Understanding the type of load or force to be measured, as well as the different types of sensors that are available, is important for the accuracy of the resulting data, and appropriate advice is available from your Techni Measure sales engineer.