FlexiForce™ *FAQ's*
Frequently Asked Questions

GENERAL OVERVIEW

Of what MATERIAL is the *FlexiForce*™ sensor made? The outer material is polyester (a brand name would be Mylar), the conductive traces are silver, and resistive inks are used within the sensing area.

Can the *FlexiForce*™ sensor measure STRESS, STRAIN, TENSION, NEGATIVE OR SHEAR FORCES? No, it can measure downward forces (load) only.

What is the RESISTANCE of the sensor? The resistance is >5MΩ at no load and 20kΩ at full load.

What is the RESOLUTION of the A101 sensor? The sensors will produce an analog signal and the resolution will depend on the electronics. *See USING A PUCK OR SHIM and ELF SYSTEM & CALIBRATION sections for more information on getting better results and greater resolution.*

Can I ADHERE the load to the sensor or the sensor to a surface? If you need to adhere the load to the sensing area, use a thin double-sided tape, which is fairly even. We don't recommend using glue because it dries unevenly. The same applies to adhering the sensor to a surface. It is best to apply tape to the shaft of the sensor rather than underneath the sensing area.

What is the LIFETIME of a *FlexiForce*™ sensor? The durability of the FlexiForce™ sensor depends on the conditions to which it is exposed: magnitude of the load, the interface material, and the direction of the load (minimal shear). We tested the sensor under "normal" conditions by applying a 50 LB. impact load on the sensor, which was between two pieces of metal, and achieved 1,000,000 cycles/hits. The data did change over that period of time.

What are the VOLTAGE CAPABILITIES of the sensor? 0.1V (as long as signal-to-noise (S/N) ratio remains acceptable) to 18V is the typical range, but might go to 24V depending on the sensor's ability to dissipate the heat (provided there is enough voltage to drive this current). Do not use a voltage divider; a constant voltage is required.

What materials/conditions could DAMAGE the sensor? Temperatures >165°F or <20°F, water-submersion for more than a couple of minutes (as the adhesive holding the top & bottom layers together would likely separate), sharp objects, shear forces, loads that are beyond the maximum range.

Can I FOLD the sensor? The sensor is made to be flexible, but do not fold on sensing area as it causes shearing. Also, do not bend the traces more than 90° as the silver conductive leads could break.

Can I CUT the sensor if it is too big? We do not recommend cutting the sensor; however, some consumers have done this. If you want to cut the sensing area, cut with a razor blade to prevent shearing, but make sure that the top and bottom silver layers on top of and below the sensing area do not touch, or you will cause a "short" to occur, which will render the sensor useless. Cutting the shaft of the sensor, the portion containing the conductive leads, also has been done.

How do I READ FORCE with *FlexiForce*™ A101 sensors? You would need to build an excitation circuit (see A101 datasheet or flyer for recommended circuit) and connect it to an Ohmmeter, voltmeter, oscilloscope, etc. Perform a calibration* with a known load so you can convert resistance or voltage change to force units. **See calibration questions in ELF SYSTEM & CALIBRATION section.*

Do you have APPLICATION examples? Yes. See Tekscan's website: http://www.tekscan.com/flexiforce/applicationlist.html.

Are *FlexiForce*™ sensors available in DIFFERENT SHAPES, lengths or sizes? The sensors come in one size and shape. Any modification to the standard design is considered a customization.

Do you have Distributors? Yes, we have International distributors across the globe. See Tekscan's website: http://www.tekscan.com/industrial/distributors.html

Does Tekscan give educational DISCOUNTS? We give large-quantity price breaks, only, due to the reasonable prices of our FlexiForce™ products.

Can I get a SAMPLE of *FlexiForce*™ sensors? We typically do not give out samples due to their low-cost.

What is your RETURN POLICY? 48 hours from receipt of merchandise. Package must be unopened.

CONDITIONING THE SENSOR

Why do you need to CONDITION the *FlexiForce*™ sensor? You should always condition the sensor prior to testing. You can do this by loading the sensor at 110% of your maximum load for a few minutes. You should cycle this load 8 - 10 times before performing the calibration. The reason for this is that the sensor changes output over the first few tests. By loading it before your calibration, you will ensure that the sensor is producing repeatable results for your calibration and testing. This will also produce a repeatable drift curve.

How incorrect are the values if the sensor is not conditioned? The error could be greater than the standard ± 5% error if not conditioned prior to testing. You should always condition the sensor prior to use.

What is the sensor PERFORMANCE? Is the RESISTANCE CONSTANT, or is it decreasing with a constant value? The inks are resistive: the greater the force, the less the resistance. See website for sensor performance graph: http://www.tekscan.com/flexiforce/flexiforce.html.

Can you give me an estimation of the time it takes to STABILIZE? 2-3 seconds for a constant load and longer if using a "spongy" load.

How long must the sensor be UNLOADED before you load it again? There is no exact or estimated time.

Is "110% OF THE MAXIMUM LOAD" what the sensor can handle? In the manual, this refers to the weight you should apply when conditioning the sensor making sure you remain within the sensor's given force range.

What is the maximum period of not using the sensor before you have to RECONDITION it? You should recondition the sensor if you haven't used it for a few weeks, and the more you recondition it, the better it should perform.

USING A PUCK OR SHIM

What is a PUCK/SHIM and do I need to use it? A puck, or shim, is an object that is used between the sensing area and load (like cheese between 2 pieces of bread) that serves to increase loaded area for point-loads when area is too small or to capture loads that are outside of the 0.375"-diameter sensing area. The PSI (pounds per square inch) should be between 1 and 10,000 PSI. If the applied force is small, e.g. 30 grams, a puck should be used to reduce the area to achieve at least 1 PSI. For applied loads that are high but have a very small area, a puck should be used to reduce PSI to below 10,000. For best results, the loaded area or puck should be between 70% (a diameter of 0.263", or area of $0.077in^2$) and 100% of the sensing area but can be reduced to achieve results as described above. Plastic pucks are recommended, as they are pliable but not too soft.

What MATERIAL is best to use? Plastic is recommended, but you can use metal and rubber as well. Rubber is more sensitive than plastic and metal is less.

What should be the maximum ROUGHNESS of the load surface? Something sharp would likely puncture the sensor. Otherwise, use your best judgment.

What SURFACE is best to use underneath the sensor? A flat, smooth surface is best.

ELF SYSTEM & CALIBRATION

What is the reason for CALIBRATING the sensor? There are several reasons. To begin with, there is a slight variance between sensor runs, which needs to be corrected for with calibration. Also, calibration helps to improve repeatability and neutralize drift when performed in a similar environment to that of the test environment. In ELF, calibrating the sensor will allow you to choose force units and adjust the sensitivity based on a known load to achieve the greater resolution. That is, if you make the sensor more sensitive the max. force range essentially shortens, giving you greater resolution.

What is the RESOLUTION of the ELF system? An 8-Bit (256 levels) A/D converter is used by the ELF electronics. Therefore, in order to estimate* sensor resolution, divide the maximum force range of the sensor by 256. (E.g. 25 lbs, which equals about 55kg, divided by 256 = 0.47lbs = .215kg = 215g). *See also USING A PUCK OR SHIM section for more information on how to achieve the best results for your measurements. *This is approximate.*

What is the maximum speed of the *ELF System*? 200 Hz for the standard ELF System & 5760 Hz for *Hi-Speed* ELF. The capture speed in each system is adjustable.

Can I use MORE THAN ONE SENSOR at a time? The current system electronics allow for one sensor input at a time, but you could use multiple ELF handles, a specific PCI card, and the *ELF 2.01 patch* found on our website at: http://www.tekscan.com/support/downloads.html. You would need to run a separate instance of the ELF software for each sensor. ***We are in the process of developing a multi-channel ELF for release in the Fall/Winter of 2001 that may incorporate up to 8 sensors at one time.*

Can LabVIEW be used with ELF? Yes, we now have the *ELF LabVIEW VI Driver software*, which allows the ELF System 1 to be used within *LabVIEW* in real-time. *LabVIEW* is a software product that allows users to collect data from a variety of inputs and process the data graphically. **LabVIEW driver is not compatible with Hi-Speed ELF.*

ENVIRONMENTAL

Are the *FlexiForce*™ sensors WATERPROOF? No. The sensors are not made for use under water.

What are the influences of HUMIDITY on the sensor? We have tested the sensors in high humidity, and their responses have been within normal limits.

Can the sensors pick up electrical NOISE? Yes, to a small degree. We have re-designed the sensor since its' introduction with both traces to one side of the sensor so there is a minute amount of space through which noise can travel.

What are the influences of MAGNETIC FIELDS OR RADIATION? What we have heard from consumers who have used the sensors around magnetic fields is that there is little or no effect. I do not know what the response would be around radiation.

CUSTOMIZATION OF *FLEXIFORCE*™ SENSORS

Customization is any modification to the standard FlexiForce™ design, such as changing lead length, sensing area size/shape, and changing the shape of the sensor in any way.

What is the SMALLEST ACTIVE SENSING AREA you can make? The smallest and largest are determined on a case-by-case basis, depending on the maximum force being applied. It may be possible to achieve $2mm^2$ as long as the pressure (pounds per square-inch) remains between 1 and $10{,}000_{PSI}$.

What is the MAXIMUM FORCE RANGE that you can make? The custom FlexiForce™ sensors can be made to measure force ranges up to a few thousand pounds as long as pressure remains below $10{,}000_{PSI}$.

What is the usual TURN-AROUND TIME for custom designs? From receipt of purchase order to completion of prototype, 8 – 12 weeks, depending on queue status at the time of order.

What is the MINIMUM PROTOTYPE order? 20 units is minimum for prototype only. Total quantities must be much higher.

What are the minimum and maximum QUANTITIES you can do annually? We require a minimum of several hundred to an unknown maximum. We have done quantities of several tens-of-thousands of units per year per custom design.

Can you make custom sensors that work with the ELF System? Yes, we can and have.

What is the AVERAGE COST of doing a custom design? Each request is different, depending on complexity of design, force ranges, quantities, etc. However, to give an idea, customization is a very involved process, and the prototype (initial design, tooling, printing-screens, set-up and production run) costs are usually above $10K.