FlexiForce - Frequently Asked Questions
FlexiForce - meinst gestellte Fragen

General Overview

What are some applications in which the FlexiForce sensors have been used?

FlexiForce sensors provide economical solutions and OEM tools to a variety of force measurement applications. Our sensors have been integrated into drug delivery devices, QA/QC equipment, industrial controls, sports and recreational gear, and more. The applications are endless and the list continues to grow. To see additional application examples, please refer to our Application List.

Sensors 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 proprietary resistive inks are used within the sensing area.

Are FlexiForce sensors available in different shapes, lengths or sizes?

The standard FlexiForce sensor is one shape, but can be trimmed to any length. We do offer a custom sensor design and manufacturing service.

What is the resolution of the A201 sensor?

The sensor will produce an analog signal and the resolution depends upon the electronics used

How does the sensor react to force? Is the resistance constant, or is it decreasing with a constant value?

The inks in our sensors are resistive: the greater the force, the less the resistance. Refer to the sensor performance graph, found in Datasheet.

How much can I overload the sensor without damaging it?

The mechanical properties of the different force range sensors are very similar. The polymer materials from which these sensors are manufactured will start to deform plastically around 8,000 PSI.

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). The sensor was tested under „normal“ conditions with a 50 LB. impact load on the sensor, which was between two pieces of metal. 1,000,000 cycles/hits were achieved. Upon completion of the tests, the sensor’s output still varied with applied load.

What materials/conditions could damag the sensor?

Temperatures >155°F, water-submersion (as the adhesive holding the top & bottom layers together would likely separate), sharp objects, shear forces, creasing the sensor, and loads that are above 10,000PSI can damage the sensor. Refer to FlexiForce® Specifications for sensor performance details.

Can I fold the sensor?

The sensor is designed to be flexible, however the sensing area should not be folded as this causes shearing. The traces should not be bent more than 90° as the silver conductive leads could break.

Can I adhere the sensor to a surface?

If you need to adhere the sensor to a surface, a thin, double-sided tape is recommended. It is best to apply tape to the shaft of the sensor rather than underneath the sensing area. An adhesive (glue) can be used if it will dry evenly

How can I measure forces greater than 100 lbs?

In order to measure forces above 100 lbs. (up to 1000 lbs.), apply a lower drive voltage and reduce the resistance of the feedback resistor (1k: min.) The force ranges of the sensors are based on our electronics. Please refer to Flexi-Force® Specifications.

What drive voltages can I apply to the sensor?

0.1V (as long as signal-to-noise (S/N) ratio remains acceptable) to 18V is the typical range. The sensors output is also a function of the drive voltage/current therefore a constant voltage is recommended (see resistive element question below).

Why do I need an excitation circuit to read force with FlexiForce A201 sensors?

You should use an excitation circuit such as the one shown here to provide a constant drive voltage/current and provide an output voltage that is proportional to the applied force.

Does the resistive element react similar to a semiconductor that varies conductance with applied voltage? YES

What is the resistance range of the sensor?

The resistance range of the sensor is typically from >5M~ at no load to approximately 5k~ at full load. This can vary depending on the electronics being used to drive and read the sensor.

How do I connect the sensor after it has been trimmed?

If Tekscan trims the A201 sensors to two inches, four inches, or six inches, the sensor will come with three (3) male square pin connectors spaced at 0.1“ (2.54mm). If you trim the sensor yourself, you will need to re-connect the sensor using one of two methods. You can purchase staked pin connectors and a crimping tool, or you can use a conductive epoxy to adhere small wires to each conductor.

Conditioning and Calibration

Why do you need to condition the FlexiForce sensor?

You should always condition the sensor prior to testing because the sensor’s output changes the first few times it is loaded. By loading the sensor before your calibration, you will ensure that the sensor is producing repeatable results for your calibration and testing. It will also produce a repeatable drift curve. You can condition the sensor by loading it at 110% of your maximum load for a few cycles.

How much error is induced 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 maximum period of not using the sensor before you have to recondition it?

You should recondition the sensor if you haven’t used it in several weeks. Please note that the more you recondition it, the better it should perform.

What is the reason for calibrating the sensor?

Calibration is a very important step. There is a slight variance between sensors, which calibration corrects. When performed in an environment similar to that of the test environment, calibration helps improve repeatability and neutralize drift.

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?

Typically, the answer is „no." The mechanical properties of the different force range sensors are very similar. The polymer materials of which these sensors are composed will start to deform plastically around 8,000 PSI.

Using a Puck or Shim

What is a puck/shim and do I need to use it?

A puck, or shim, is an object placed between the sensing area and load (like cheese between two pieces of bread) to ensure that the sensor captures 100% of the applied load if the contacting surface is larger than the sensor diameter and to reduce high pressure for point load applications. The applied pressure 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. The material used should not induce a large shear force on the sensor when a normal load is applied.

How rough can the load surface be?

Use your best judgment, keeping in mind that a sharp point on the surface would likely puncture the sensor.

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

ELF System and Calibration

Why do I need to calibrate the sensor?

With the ELF system, calibrating the sensor will allow you to choose force units and adjust the sensitivity based on a known load to achieve the best resolution. If you increase the sensitivity of the sensor, the maximum force range essentially shortens, giving you greater resolution.

What is the resolution of the ELF system?

Elf electronics includes an 8-Bit (256 levels) A/D converter. In order to estimate sensor resolution, divide the maximum force range of the sensor by 256. (E.g. 25 lbs, which = about 55kg, divided by 25 =0.47lbs =.215kg = 215g).

What is the maximum speed of the ELF System?

The maximum speed is 200 Hz with the standard ELF System, and 5760 Hz with the Hi-Speed ELF. The capture speed in each system is adjustable.

Can I use more than one sensor at a time?

Yes, with the Multi-Handle ELF (MELF) software and appropriate number of handles, you can use up to 16 sensors at a time. Please refer to our website for more information on the MELF system and software.

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. For more information on LabVIEW, refer to What is LabVIEW?

*LabVIEW driver is not compatible with Hi-Speed ELF.

Environmental

Are the FlexiForce sensors waterproof?

No, the sensors are not designed for use under water, as the adhesive holding the top and bottom layer of the sensor together would likely separate.

What are the influences of humidity on the sensor?

The sensors have been tested in high humidity, and their responses have been within normal limits.
What are the influences of magnetic fields or radiation?

Can the sensors pick up electrical noise? Yes, to a small degree.

What are the influences of magnetic fields or radiation?

Consumers who have used the sensors around magnetic fields have reported little or no effect. The sensors' response to radiation is unknown.

Customization of FlexiForce Sensors

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 PSI 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 turnaround time for custom designs?
From receipt of PO to completion of prototype, 6 – 12 weeks, depending on queue status at the time of order.

What are the minimum and maximum quantities you can do annually?

Due to the cost involved, we typically do not design custom sensors for quantities less than 1,000. The maximum quantities that can be produced depend on several factors. 1,000,000 custom sensors per year should not pose a problem.

Can you make custom sensors that work with the ELF System?
Yes, we can customize sensors for use with the ELF System.