Tekscan™

Best Practices in **Mechanical Integration** of the FlexiForce™ Sensor

Thin, customizable FlexiForce sensors measure normal compressive forces in your device. While every application is unique, there are some universal considerations and general best practices to consider to achieve optimal performance of the FlexiForce™ sensor.

Following these recommendations during prototyping will help you to control costs, minimize design time, and achieve optimal sensor performance.

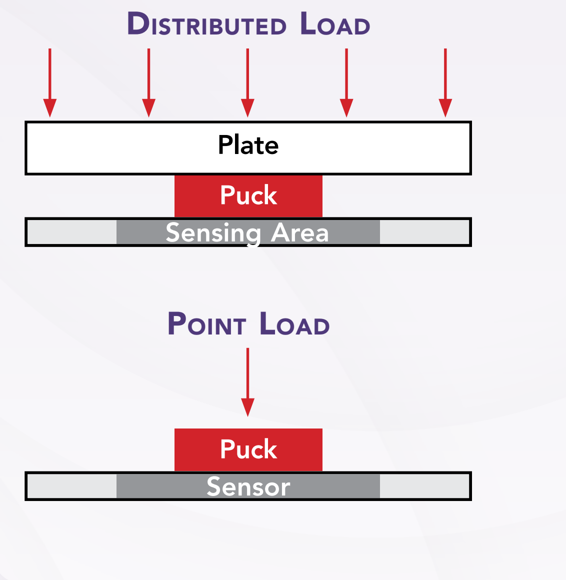
***NOTE:** the scenarios outlined in this document are not an exhaustive list. We encourage you to engage with our Application Engineering team early in the process.*

1 A PUCK ENSURES EVEN LOADING AND REPEATABLE, ACCURATE OUTPUT

Why is a puck so important? Let's begin with the actuator size. We generally recommend that 100% of the force be concentrated within the sensing area, and that a maximum of 70-85% of the sensing area be loaded. The best way to accomplish this is through using a load concentrator, or puck, in two specific loading scenarios:

Scenario 1: Distributed Load

The contact area is bigger than the sensing area. In this scenario, offloading will occur, resulting in a portion of the application load transmitting to the sensing area. The implication? Inaccurate measurement and inconsistent repeatability from cycle to cycle.



Scenario 2: Point Load

The contact area is much smaller than the sensing area. Engaging a discrete point on the sensor without the use of a puck could result in excessive contact pressure, resulting in plastic deformation, compromising sensor repeatability.

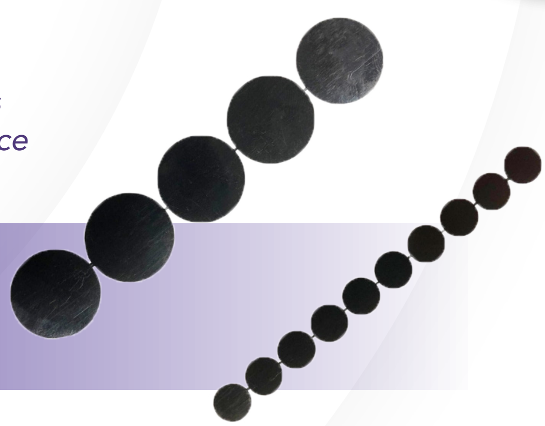
The next consideration is the **position of the actuator.** If the actuator does not load the same area each time, a variable output can result. Using a puck will compensate for both of these scenarios.

Three key questions to help determine if you need a puck:

1. *What is the contact area of the actuator relative to the sensing area of the sensor? If it's much larger or smaller than the sensing area, using a puck will ensure optimal performance of the sensor.*

2. *Is the actuator loading the same area each time? If not, a puck is necessary.*

3. *What material should my puck be? Compliant and rigid interface materials can behave differently when it comes to linearity, hysteresis, sensor response, shear, etc. During the design phase, testing with different interface/puck materials should be performed to determine the ideal puck or interface material for your application.*



DID YOU KNOW?

Tekscan sells peel-and-stick pucks from our online store.
Visit www.tekscan.com/pucks to purchase.

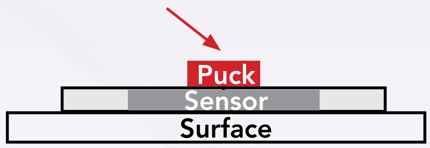
2 MINIMIZE SHEAR FORCE TO PRESERVE SENSOR SENSITIVITY

Shear force is present when there is any type of loading that isn't completely normal to the sensor. Fortunately, when the proper steps are taken, users can avoid any unintended sensitivity loss due to shear. What conditions could cause shear, and how can you protect the sensor?

Scenario 1: Non-Normal Load

In many of these cases, a puck adhered to the sensing area will reduce the effect of shear on the sensor.

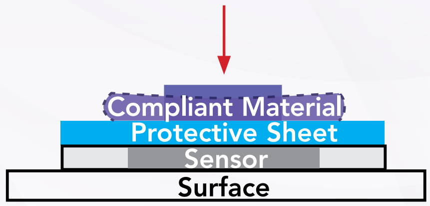
Non-Normal Load



Scenario 2: Material Squirm/Deformation

This is a consideration if the sensor is placed under a compliant material with a significant friction factor. For example, when rubber is compressed, the edges tend to expand, or deform. This deformation can be quantified through Poisson's Ratio. Poisson's Ratio is the ratio of transverse strain to axial strain when rubber is stretched/compressed (P= -(transverse strain/ axial strain)). The sliding of the deforming rubber across the sensor face can impart shear. In this scenario, a protective sheet on the sensor – such as Teflon or stainless steel shim stock – will help to decouple the shear from the sensor and work to transmit normal forces exclusively to the sensor.

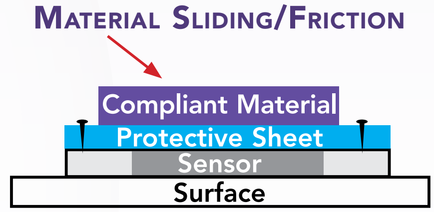
Material Squirm/Deformation



Scenario 3: Material Sliding/Friction

Any two materials in contact with each other under motion will experience friction. Depending on how significant the friction is, the sensor can experience shear, thus losing sensitivity. To avoid this, consider the top and bottom of the sensor; if it is determined that both sides are being exposed to motion, then both sides should be protected. In this scenario, stainless steel shim stock or Teflon is useful in protecting the sensor from materials sliding across it.

Material Sliding/Friction



Always mount protective materials in a fashion that decouples shear force and will be suitable for the application assembly. Contact us to discuss optimal material configuration for your design.

❸ MOUNTING THE SENSOR

Ask yourself: Have I considered how I'm going to mount the sensor?

We typically recommend using double-sided tape when mounting the sensor as it offers a thin, consistent surface for adhesion. We advise avoiding hard-setting adhesives or epoxies as they can introduce pressure points under the sensor and disrupt the transmission of force to the sensing area. For custom sensor designs, Tekscan can provide a "peel and stick" backing, and even design holes into the sensor for screw/clamp-type mounting.

Double Sided Tape

Avoid Hard-Setting Adhesives or Sprays

4 ADDITIONAL RESOURCES

BEST PRACTICES IN ELECTRICAL INTEGRATION

The complete **"Best Practices in Electrical Integration"** guide provides key recommendations for ideal circuit selection and implementation for your embedded project. The guide covers:

- Circuit selection
- Sensitivity adjustment processes
- Calibration procedure, and more!

FLEXIFORCE INTEGRATION GUIDE

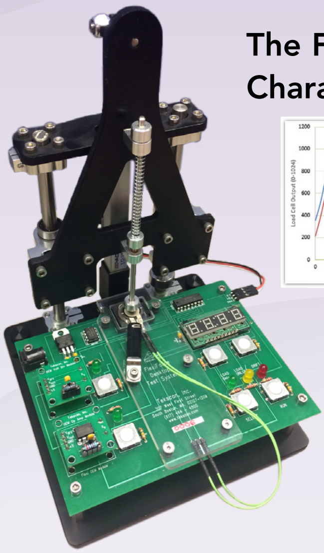
For in-depth OEM integration recommendations, download the complete **"FlexiForce Integration Guide."** This guide is intended to help you optimize design, reduce costs, and streamline the overall sensor design & embedding process from prototype to production.

The "FlexiForce Integration Guide" includes additional mechanical considerations to help with your OEM project, including:

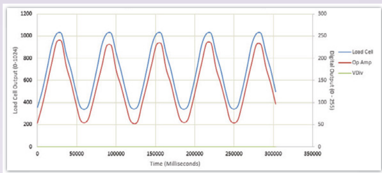
- Characterizing sensor performance
- Soldering
- Effects of temperature on circuit and calibration
- Sensor/circuit duty cycle
- Design walk-thru examples, and more!

5 FlexiForce OEM Development Products

Tekscan offers two FlexiForce Integration Kits to help engineers test and evaluate FlexiForce Sensors for their embedded product or device. These include:



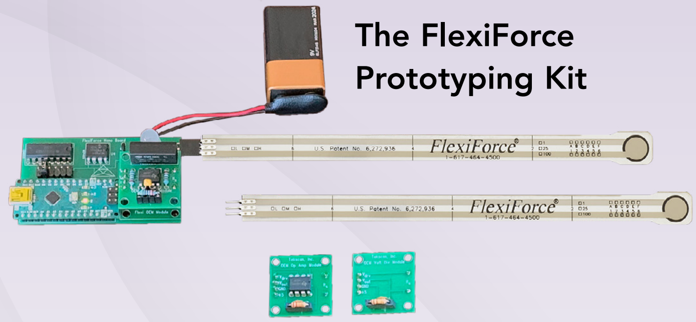
The FlexiForce Sensor Characterization Kit



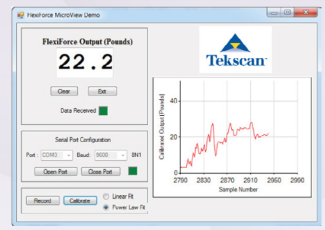
Learn More!

- An all-in-one testing fixture to help collect baseline sensor performance in a controlled loading environment
- Test interfacing materials with pre-programmed loading profiles in open-source software:
  - Linearity
  - Hysterisis
  - Drift
  - Repeatability
- Use with any FlexiForce Standard Sensor model, except the A101

The FlexiForce Prototyping Kit



Learn More!



- A compact, plug & play kit to help engineers and designers progress smoothly through later integration phases
  - Begin collecting data in minutes!
- Test with different circuitry and make sensitivity adjustments with ease
- Use with any FlexiForce Standard Sensor model, except the A101

What's Next?

Are you considering embedding a FlexiForce sensor into your product? Contact our Application Engineering team today to help bring your OEM project to life.

CONTACT US: 1.800.248.3669 / +1.617.464.4283
www.tekscan.com/FlexiForce

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