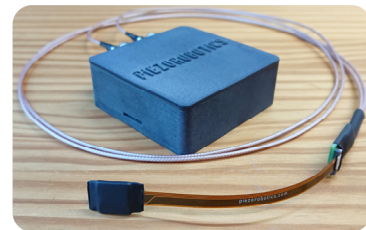


## pr.RubSens – PiezoRobotics Rubber Force Sensor

The PiezoRobotics' pr.RubSens is a highly sensitive force sensor made of a soft rubber material. It is the next generation of force sensors, evolved from the traditional metal-based and stiff load cells, benefiting from a highly precise digital electronics and better connectivity. By using the provided signal conditioner, the pr.RubSens converts a static or dynamic mechanical input force into digital data directly in Newton. The principle of operation is based on an electroactive elastomer combined with a highly sensitive capacitive sensing technology. The pr.RubSens is useful in compliant systems that require static or dynamic force measurement, but cannot accommodate large or stiff load cells.

### Key Features

- Power supply and digital data over USB
- High resolution and low noise
- 400 Hz Bandwidth



### Technical Specifications

Sensor Specifications	Value	Notes
Sensitivity	10 pF/N	@ 1 N force
Resolution	0.006 N	@ sampling rate = 160 Hz
Accuracy	±6%	
Noise	1.3 mN <sub>RMS</sub>	
Measurement Range	0 – 200 N	
Frequency Range	0 – 400 Hz	@ sampling rate = 800 Hz
Sensing Material	Electroactive elastomer	
Stiffness	6.8 daN/mm	@ 20 Hz
Sensing Element Dimensions	11 x 11 mm	
Operating Temperature	-40°C to +120°C	
Weight	2.6 g	
Signal Conditioner		
Power Supply	5 V <sub>DC</sub> / 27 mA over USB	
Signal Connector Type	FPC connector	

### Applications

Vibration Condition Monitoring, Load Data Acquisition, Vibration Isolation, Active Vibration Control, Robotic Tactile Sensing, 3D Stress Mapping.

## Mechanical Mounting

The pr.RubSens can be mounted between two structures that will observe relative movement and generate axial compressive forces. The pr.RubSens can also be integrated within a cavity of a soft material subject to stress. A flat contact surface to the sensor is not required, as the sensor will fit to the external shape once under compression.

The pr.RubSens should not be exposed to tensile forces. In applications with bi-directional forces, a pre-load force is recommended with a magnitude at least equal to the maximum tensile force expected, which guarantees that the sensor is always under compression.

A temporary adhesive mounting can be done with a double-sided tape (3M 9448A) at the base of the sensing element. A permanent mounting can be done with an instantaneous adhesive (Loctite 480).

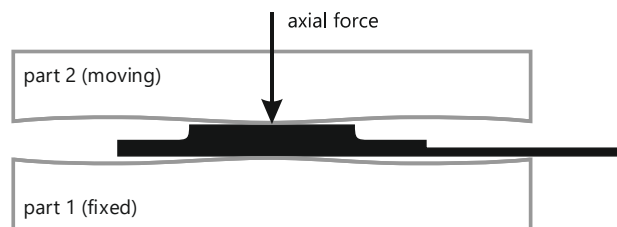


Figure 1. Mechanical mounting and integration of the pr.RubSens

## Electrical Connection

Attached to the sensing element of the pr.RubSens is a flexible flat cable that can be easily attached and detached to the FPC connector of the signal conditioner (golden contacts facing up). If needed to be bended, a minimum bending radius of 2.0 mm should be observed for the flat cable.

The sensing element, the flat cable and also the signal conditioner cable and electronics are shielded against electromagnetic interference (EMI).



Figure 2. pr.RubSens with 1 sensing element

## Operation

The pr.RubSens is based on an electroactive elastomer that exhibits a capacitive property. Under compressive load, the electrical capacitance of the elastomer changes slightly. The signal conditioner contains a highly sensitive capacitance measurement circuit able to detect the change and convert it

into digital data. By using the correct calibration data, the axial compressive force can be measured. The force in Newton is streamed by the signal conditioner and can be read by a PC via a serial port.

### Calibration Data

The digital force output generated by the signal conditioner depends on the input compression force on the sensing element (location, pressure distribution, amplitude, frequency, loading or unloading behavior) and also on temperature. Resolution depends on the sampling rate and on the force amplitude and can be customized. Figure 3 shows a typical calibration data for static forces at 24°C.

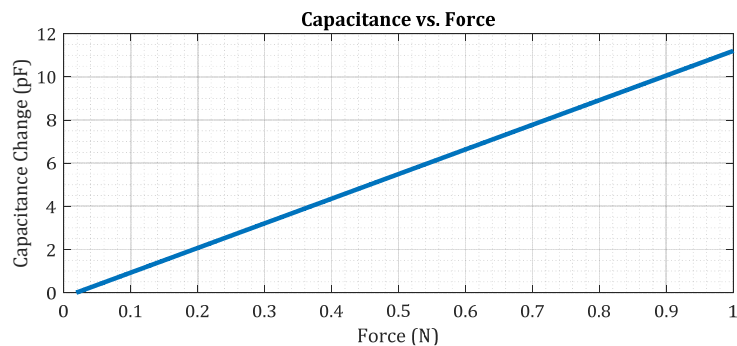


Figure 3. Electrical capacitance change of the pr.RubSens vs. input compression force

### Quality and Testing

Each pr.RubSens is individually tested. A calibration datasheet is provided with each delivery.

### Dimensions

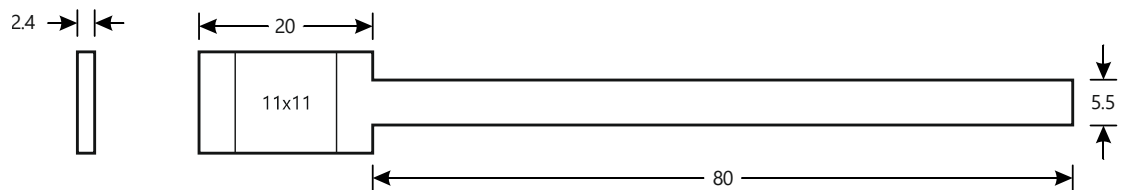


Figure 4. Dimensions of the pr.RubSens with 1 sensing element

### Customization

PiezoRobotics has the capability to customize the pr.RubSens according to your specific application and requirements. We can modify the sampling rate, dimensions, connectors and integrate it with your electronics and IoT Network. We also guarantee much lower prices for high volume purchases. Please contact us for further details.

## Package Content

1 x pr.RubSens

1 x Signal Conditioner

1 x USB Cable