Overview – Stretch Sensor Kit

(Preliminary)

Wireless Sensor Kit overview

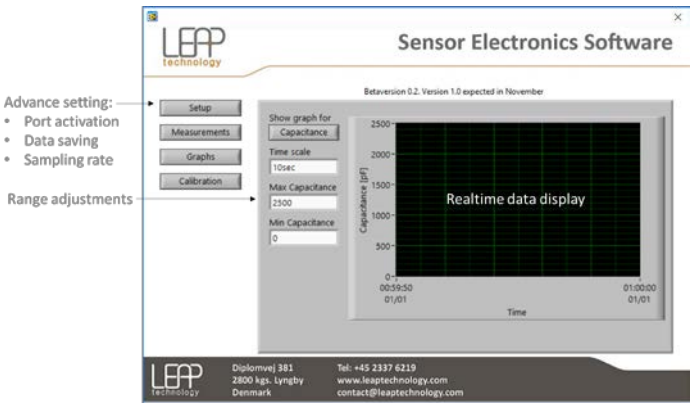
The stretch sensor kit enables you to quickly get hands on with our stretch sensors.
The kit can be used for unobtrusive monitoring of soft structures such as the human, textiles, and other flexible structures.
It is ideal for prototyping wearable motion capture or for characterising the sensors with a view to product integration.

Contents

The stretch sensor kit includes:

- Two stretch sensors (see datasheet),
- One wireless measurement electronics measuring up to 4 sensors simultaneously (see datasheet),
- Charging wires,
- USB drive containing graphical user interface software.

Graphical user interface



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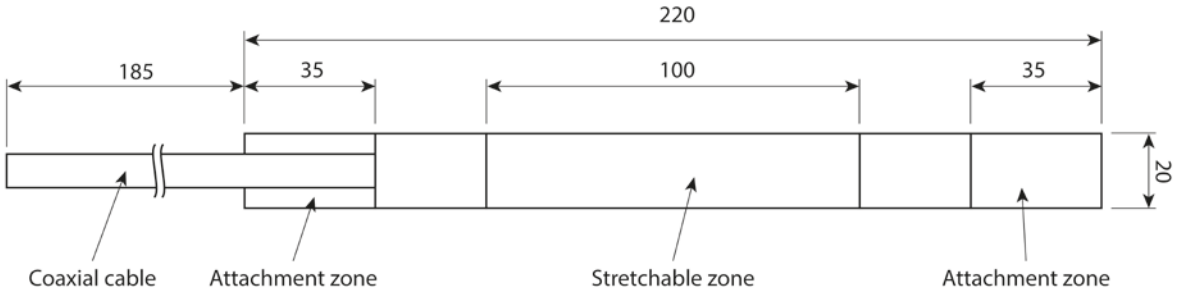
Elastomer stretch sensor (04D0010)

Made from high quality elastomer materials, the LEAP Technology stretch sensor is a versatile, **highly elastic capacitive strain gauge.**

- Highly stretchable sensor enables unobtrusive motion capture of human, machines, and complex surfaces;
- Capacitive sensing characteristic ensures accurate and repeatable measurements;
- Easy textile integration due to its low profile and textile based cabling;
- Inherently tolerant to shock, vibration and misalignment;
- Minimum response to applied surface pressure;
- Washable.

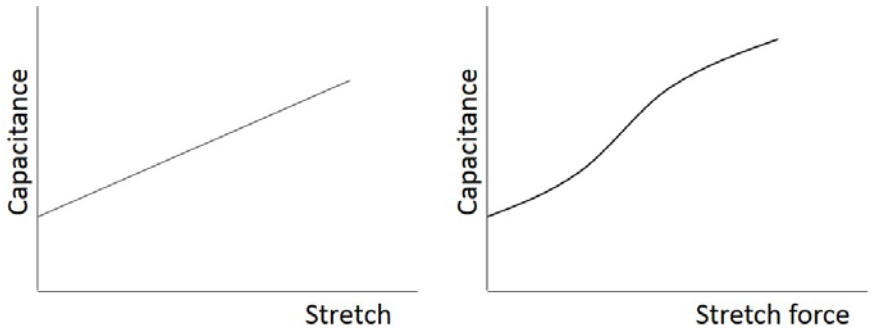
Dimensions (mm)



Note: Stretchable zone thickness: 0.4mm

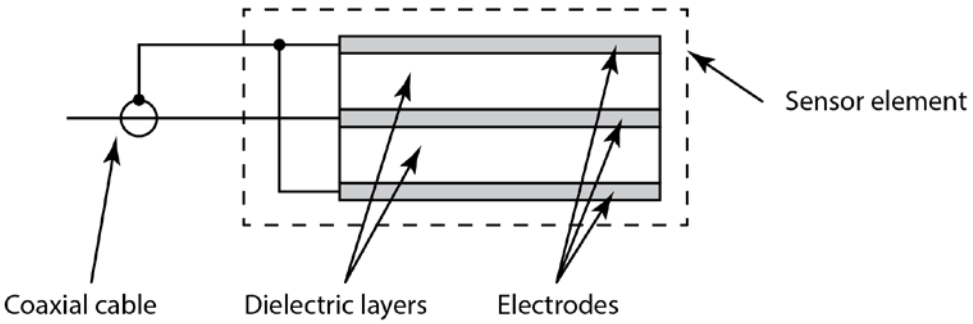
Working principle

The sensor's capacitance change to stretch or displacement is highly linear and repeatable. The response to applied force is non-linear, though highly repeatable, owing to the non-linear modulus of the materials used in the construction of the sensor.



Internal construction

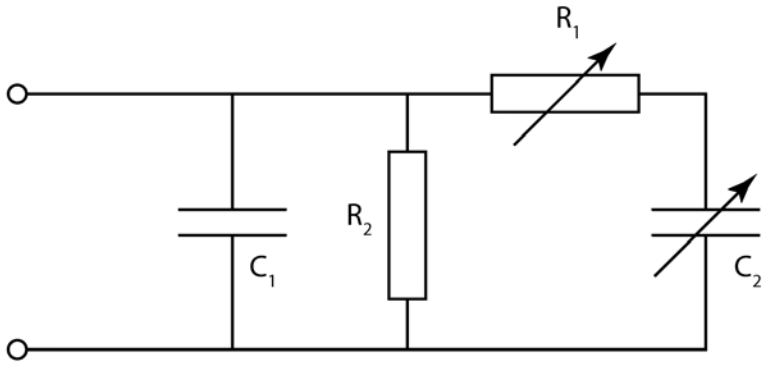
The sensor is constructed with three electrodes, the outer two of which are connected to the screen of the coaxial cable. This is to allow electronics to measure the capacitance in such a way that minimises capacitive coupling to other objects. This is especially useful in wearable devices.



Specifications

Parameter	Value	unit
Maximum stretch	80	mm
Capacitance at rest* (C_{2min} + C_1)	1	nF
Capacitance at full stretch* (C_{2max} + C_1)	5	nF
Series resistance – fluctuating (R_1)	10 to 100	kΩ
Parallel resistance (R_2)	<1	GΩ
Load at maximum stretch*	6	N
Weight*	6	grams

***Indicative figures.** These sensors are highly customisable in shape, size, stretch, sensitivity, connections and encapsulation type. Please contact us for custom versions and specific product development and testing needs.



Equivalent electric circuit

Measuring the capacitance

It is recommended to use a constant current charging circuit to measure the capacitance in such a way that makes the measurement insensitive to the fluctuating value of R_1. LEAP Technology supply such electronics for measuring the capacitance and converting it into the units of choice. Please contact us to learn more.

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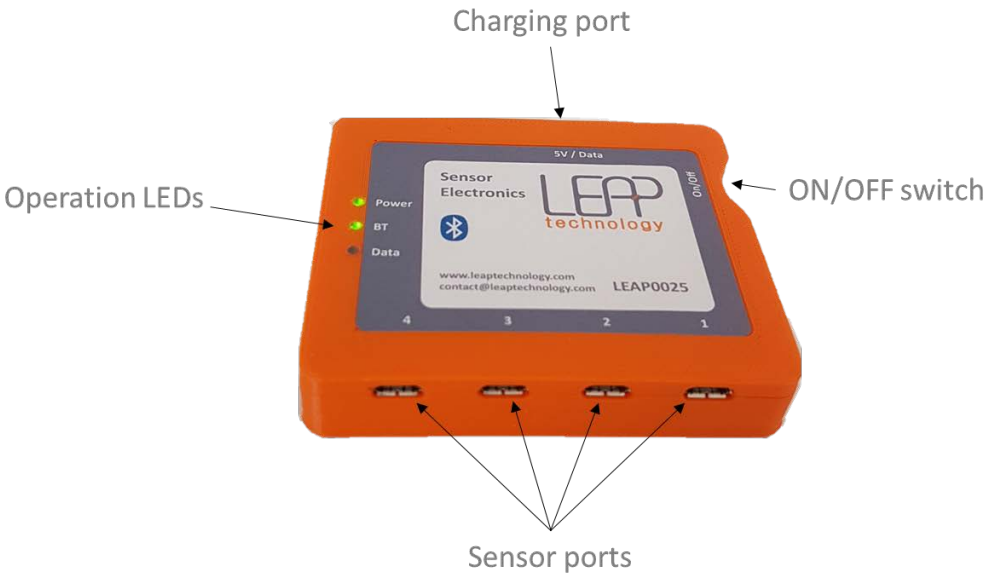
Wireless sensor electronics

This easy to use electronics box is designed for capacitive sensor measurements. The included circuit and software is capable of measuring capacitors with variable capacitance as well as variable equivalent serial resistance (ESR), thus making it ideal for electroactive polymer (EAP) sensor measurements. Due to its universal measurement technique, this device can measure EAP sensors of LEAP Technology as well as those from third parties. The circuit is supplied with proprietary PC software that enables you to measure, save, and display real-time data. An API is available upon request. The board can measure up to four sensors and is equipped with Bluetooth and cable connections for transferring data.

Inputs and outputs



Technical specifications

Item	Value	Description
Power supply	5V	
EAP sensor ports	Up to 4	Software selectable. Can be upgraded to 8 sensor ports.
Communication platform	Bluetooth and USB	Software selectable
Measurement range	0.1 – 10nF	Software selectable
Excitation frequency	100 – 800Hz	Software selectable
Digital update rate	0.1 – 800Hz	Software selectable
Averaging number	n = 1 – 100	Software selectable
Resolution	1pF	
Maximum Series resistance	100 kOhm	
Operation temperature	10 – 60°C	

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Quick start guide (Beta)

This document describes the basic installation and use of the sensor electronics and associated software. The Sensor Electronics is supplied in both the stretch sensor and force sensor evaluation kits. You will have either received a USB storage device with the software on, or a link to a shared web based location for download.

System requirements

The software of sensor kit is designed for a Windows PC with Windows XP SP3 or later version of operating system.

Software installation

Before using your sensor electronics, two pieces of software will be installed on your PC through one installation process.

1. The sensor electronics program, which displays the output of the sensors on a computer.
2. A small application that allows your computer to communicate with the sensor electronics through a USB port via serial communication.

Either open the link to the web location or Insert the USB storage device in one of your computer USB ports. Run the **setup.exe** file and follow the instructions on screen, restarting the computer when prompted and when finished. The software is now ready to use. The software will be located: C:\Program Files (x86)\LEAP Technology Sensor Electronics Software. For convenience, create a shortcut to LEAP.exe on your Desktop.

Hardware connection

- Connect a sensor to one of the sensor ports.
- Turn on the electronic with the On/off switch.
- If necessary, connect the supplied cable to a USB socket on your computer (this will allow you to charge the device during first use).

Software operation

- During the first use, the device should be paired manually with the computer with the following steps;
  - From **Start** button select **Settings**>**Devices**>**Bluetooth**,
  - Turn on **Bluetooth**>select the device (**LEAPXXXX**)>click **Pair**,
  - Follow the instruction.
- Launch the application software (LEAP.exe).
- Click the “find device” button, and choose Bluetooth or cable connection.
- Click the Configure button and click on the channel(s) you have connected the sensor(s) to.
  - Here, change the minimum capacitance if needed.
  - Click the red button (turning it green) next to “enable”.
  - Click “done”.
- Click the “Start measurement” button to begin sending sensor data to the computer (it turns green).
- Clicking the “graphs” button will show the current sensor output on screen
  - Note that max and min values may need to be changed to see the output. We suggest you enter 0 for min and 5000 for maximum in the first place, then adjust according to your use.
- If using the wired connection and a lot of noise is visible on screen, first try using the Bluetooth connection. If this is not possible, please contact LEAP.
- Reboot the hardware and restart the software in case the “find device” operation was generating an error massage.

Further use

This software can also log and save data, and has a calibration routine to enable conversion from raw sensor signal to a parameter of your choice (please contact us for more information).