Sensable Technologies

Uncolored Ink Sensor on Fabric

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Specification Sheet	
Dimensions of Product	Fabric is 7”x2”x.0165” Each sensor is 1.5”x.25”x.0165” *insert picture*
Features of Product	A fabric backing with 1 set of two sensors on the fabric. The sensors can be set up in circuit and will act as strain gauges that will lower resistance as the fabric/sensor is stretched.
Intended Use	The intended use is to monitor the stretch or deflection of an object. The main example is the deflection of the skin of the abdomen of a pregnant women during fetal movements. In reality the sky is the limit as long as a circuit can be made and data transferred.
Cycle Tolerance	67% - Percent strain to break
Material/Mechanical Properties	0.7 lb/in - Stiffness of fabric and sensors
Starting Resistance	1-50 M Ohm - Average starting resistance of 24M Ohm. Standard deviation is 23 M Ohm
Electrical	150 mAh- Recommended current supply for basic microcontroller with Bluetooth capabilities to last for 1 week without charging
Electrical Drift	6.7 Ohms/cycle- Starting resistance changes these many ohms per cycle once 1000 cycles is reached
Environmental Factors	*##* - Maximum and minimum allowable heat *##* - maximum and minimum allowable humidity
Life Span	At 30% strain maximum to infinite lifetime

Sensable Technologies Screen Printed Sensors

Scope:

This document is a preliminary specification sheet covering mechanical and electrical properties of piezo-resistive screen-printed silicone strain gauges produced by Sensable Technologies. Primary sensor ingredients include silicone screen-printing material, and nickel nano-particles. Main uses for these sensors include measuring fabric strain up to 100% in smart textiles.

Features

-Up to 100% Strain (depending on strain capability of fabric)

-Resistance decreases with positive or negative strain

-Very low power consumption (sensor current draw increases only when strained)

-Low cost and simple manufacturing

-Isotropic mechanical and electrical properties.

-Washable (tested up to 20 cycles at 30 °C)

-Negligible electrical hysteresis

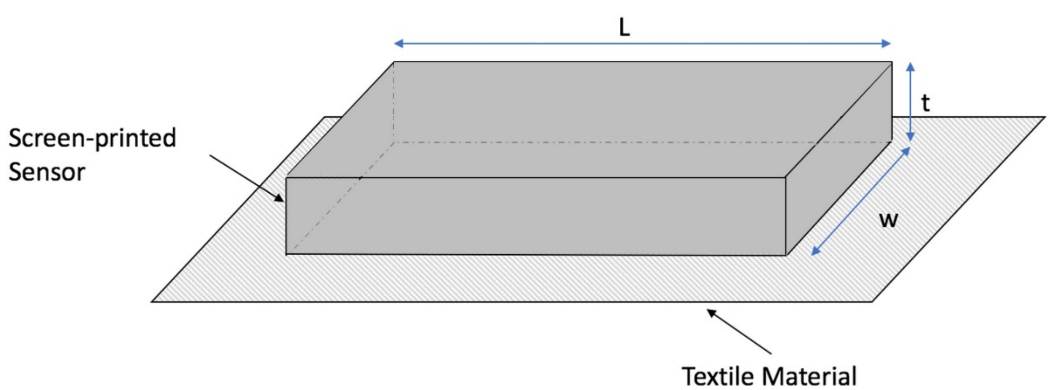
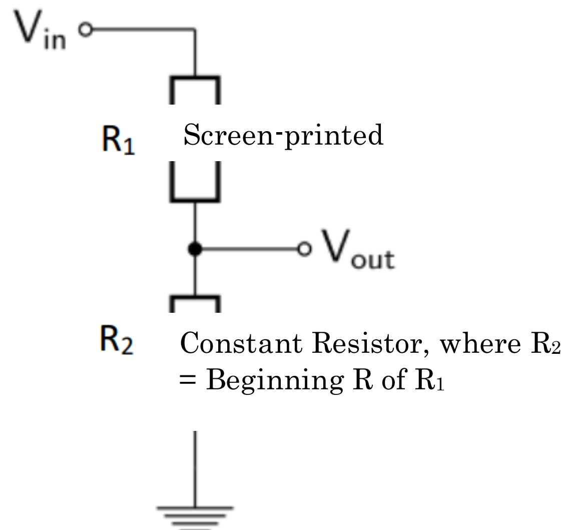


Figure 1: Drawing of screen-printed sensor

Suggested Electrical Measurement Circuit



Electrical Properties and Associated Test Methodology:

Data in Table 1 was acquired using the following test parameters:

- Attached fabric: 92% polyester, 8% spandex
- Dimensions of sensor: L=2.54 cm, w=.6cm, t=.3mm
- Strain: 0-30% at 550 mm/min. Hold time of 0.2 seconds at beginning and end of stroke. Cycle period is approximately 0.5 seconds.
- Cycles completed: 2000
- Resistance data gathered using circuit in figure 1, where V_{in} = 5V Peak to Peak square wave at 20 Hz with a 2.5 VDC offset. Signal is generated and analog voltage data is gathered using an Arduino Uno, where V_{out} is measured at 5V square wave peak only. A low pass filter can be used to reduce noise with a digital filter or a capacitor connected between V_{out} and GND.

Sensor Type*	Average resistance of relaxed sensor**	Average resistance of 30% strained sensor**	Average price per sensor
Type 1 Composition 1	>10 MΩ	<1kΩ	$2 USD
Type 1 Composition 2	Between 1-10kΩ	<200Ω	$2 USD
Type 2 Composition 1	>10kΩ	<1kΩ	$1 USD
Type 2 Composition 2	>1MΩ	<100kΩ	$1 USD

Table 1 - Sensor Resistance and Price Data

Currently sensors must be *pre-strained* by cycling them for up to 500 cycles. After this point, resistance drift in the sensors is greatly reduced. Current R&D efforts are primarily focused on understanding this phenomenon.