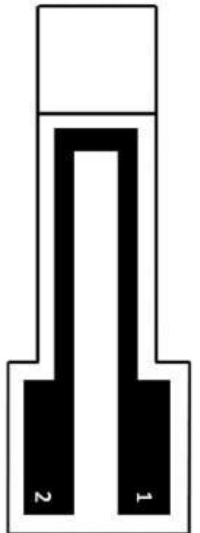


DATASHEET

Graphite Sensor

Description of the sensor

The graphite sensor measures the change in resistance as a function of paper sheet deformation. This sensor is made from graphite on a 0.16mm-thick sheet. The graphite can be 2B, 2H, 6B, HB or F, giving different resistance values. When the sensor is compressed, the carbon molecules move closer together and the sensor's resistance decreases. Conversely, when the sensor is energized, the graphite particles will move away, so the sensor's resistance will increase.



Properties of the sensor

- Weak weight (<10g)
- Easy to use
- Easy to produce
- Low Tech product
- Room temperature

Dimensions of the sensor

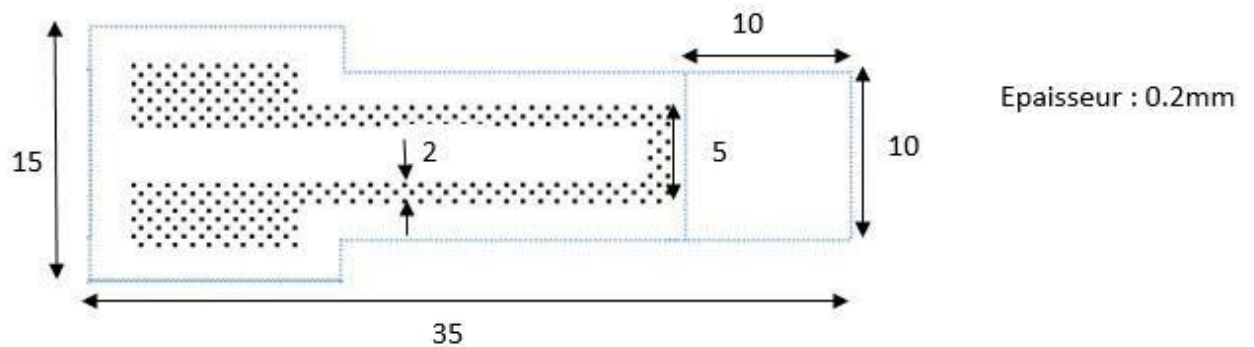


Figure 1 : Dimensions of the sensor (in mm)

Description of pins

Numéro du pin	Spécifications
1	Vcc
2	Vout

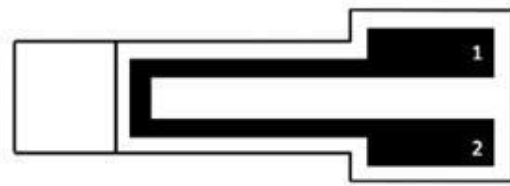
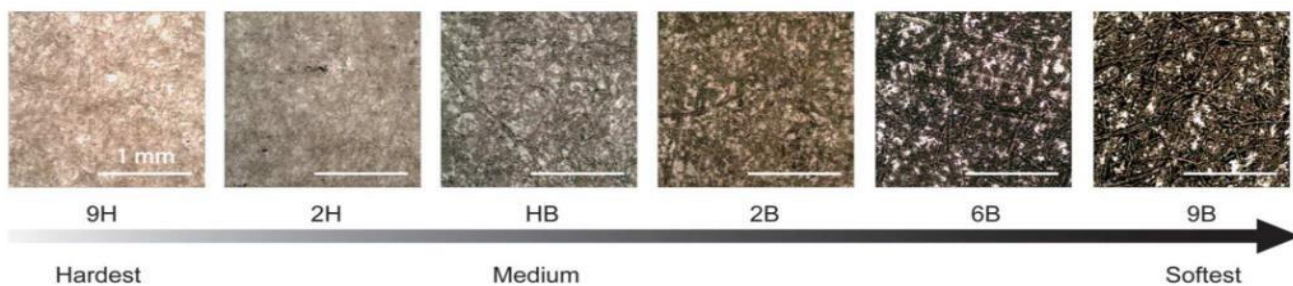


Figure : Pins' description



Softer leads => higher graphite content => lower resistances => lower sensitivity

Typical electric characteristics

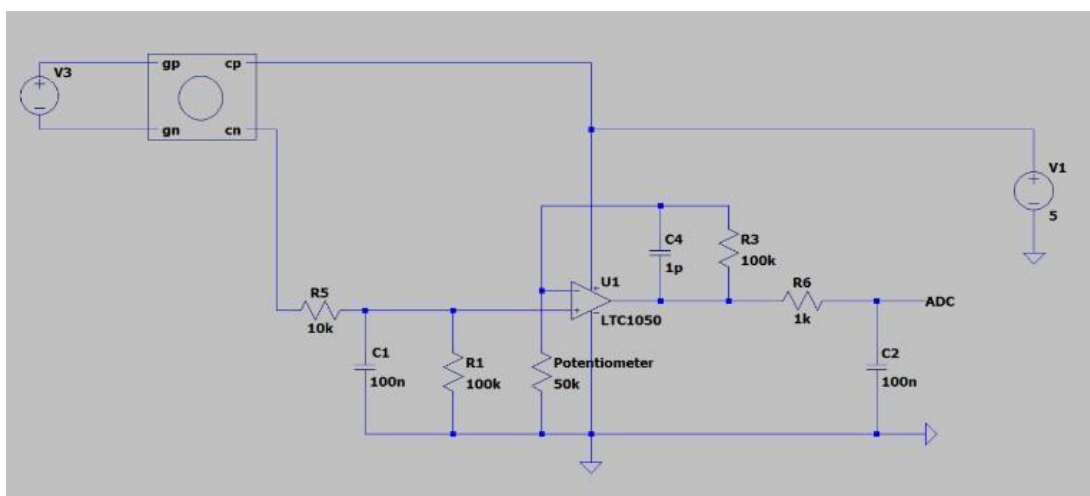
	Unity	Values		
		Min	Typ	Max
Vin	V	3	5	7
Pencil 2H	MOhm	5	15	35
Pencil HB	MOhm	630	800	1019
Pencil 2B	MOhm	380	680	1019

Specifications

Sensor	Flex Sensor
Type	Passive (External Vin)
Vin	5V
Vout type	Analog
Response time	<500 ms
“Mesurande”	Resistance
Application	Tension and compression strain measurement

Analog amplifier circuit

The graphite sensor is connected to an operational amplifier to amplify the signal.

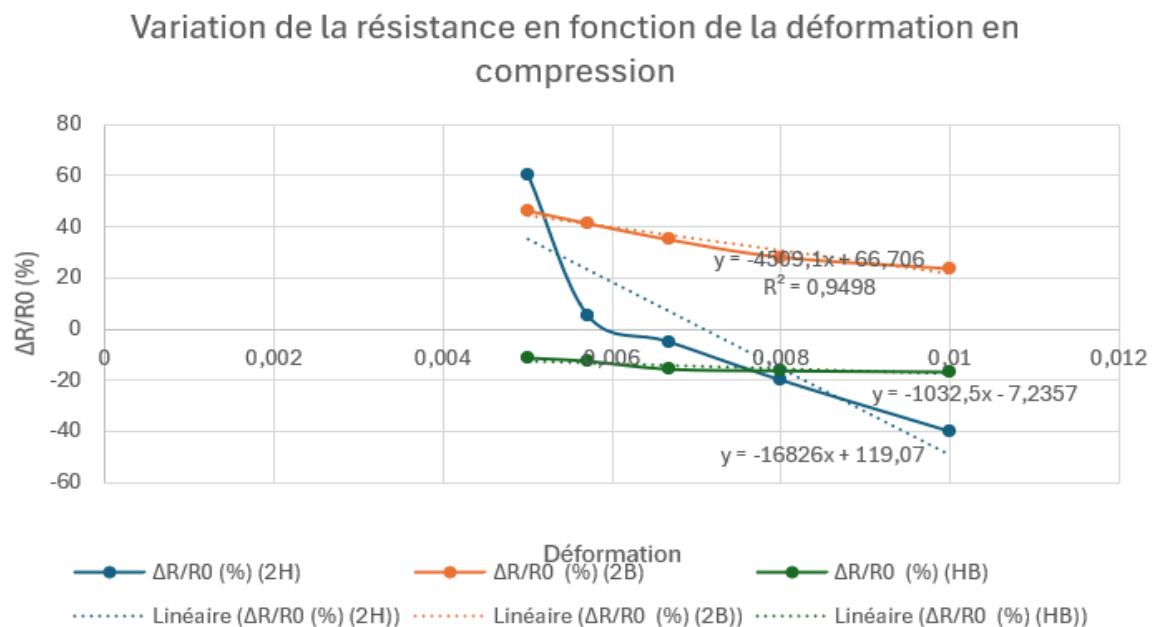


To obtain the resistance value of the graphite sensor, use the following formula:

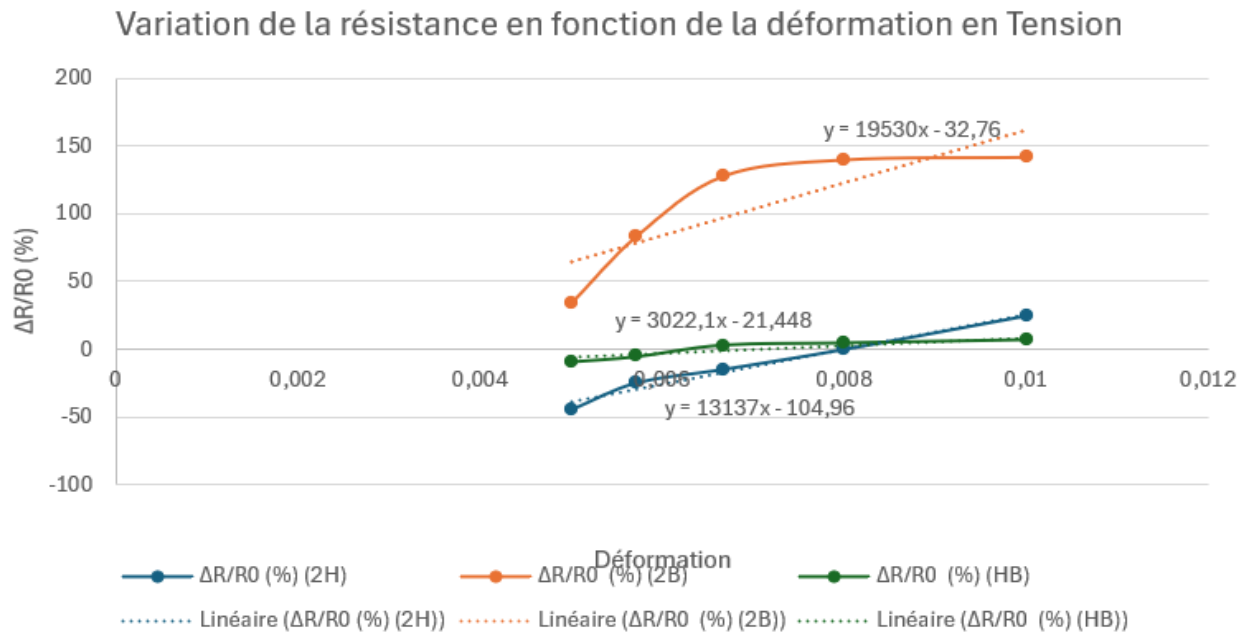
$$R_{mes} = R1 * (1 + \frac{R3 V_{cc}}{R2} * \frac{1}{V_{adc}} - R1 - R5$$

The variable resistor R2 is used to adjust the gain of the circuit via the potentiometer.

Characteristic graphs and sensitivities



	<u>Sensibilité (Compression) en mV/cm</u>
Crayon 2H	201,2682
Crayon HB	53,84
Crayon 2B	137,56



	<u>Sensibilité (Tension) en mV/cm</u>
Crayon 2H	226,698 mV/cm
Crayon HB	105,6 mV/cm
Crayon 2B	718 mV/cm

- Incoherent values according to our judgment for the 2B pencil => elimination of our study. Hypotheses:

User touching the clamps attached to the sensor during the measurement, poorly colored sheet...

- Consistency in the values obtained for HB and 2H pencils in compression and tension => we therefore keep them for our study.

- The sensitivity of the commercial **Flex Sensor** is around **160 mV/cm**.

- HB Sensitivity < Flex Sensor Sensitivity / 2H Sensitivity > Flex Sensor Sensitivity.

- Flex Sensor Cost > Graphite Sensor Cost

Our 2H pencil-based sensor is therefore more sensitive than the commercial Flex Sensor, which will allow it to fully meet the objectives related to applications in certain fields (biomedical, electronics, instrumentation), which require good sensitivity for acquisitions, and at a lower cost.

Note that the HB also has good sensitivity. Although it is lower than the flex sensor, the HB will also make it possible to make acquisitions requiring precision, always at a lower cost.