

High performance M&NEMS sensors



Generic technology for accelerometers,
pressure sensors and gyrometers

What is M&NEMS?

CEA-Leti has developed a new design and detection method combining micro- and nano-electromechanical systems (M&NEMS), further pushing the boundaries of existing MEMS technologies.

A MEMS uses electricity as its energy source to fulfill a sensor or actuator function. Multi-accelerometer, gyrometer and pressure sensor technology is implemented in CEA-Leti's case.

When used as a sensor, a MEMS features a moving part sensitive to a physical quantity (e.g. speed, pressure, direction). Variation of this physical quantity is then converted into an electrical quantity, which is then analyzed by the MEMS electrical part. Sometimes, it integrates a micro-actuator, which will act on the mechanical part on receiving an electrical signal.

Applications

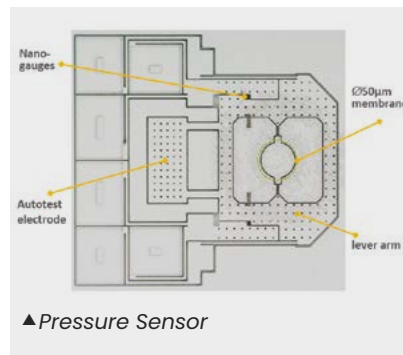
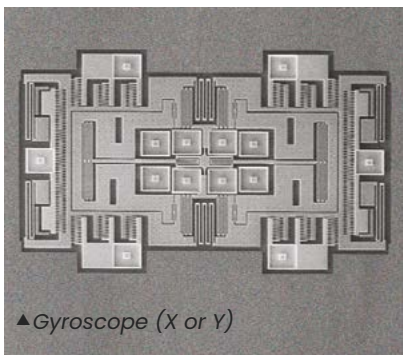
This technology finds applications in various markets including:

- The environment
- Medical devices
- Industry and robotics
- Automotive
- Defense
- Consumer market

What's new?

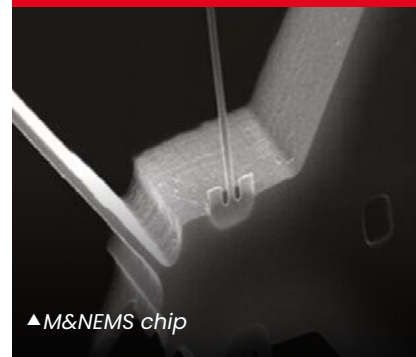
M&NEMS technology is based on piezoresistive detection using silicon nanowires (nanogauges).

When the component sustains an external action, e.g. an acceleration, pressure or rotation, the movement of a moving mass (accelerometer or gyrometer) or a membrane (pressure) induces stresses on nanogauges via a lever arm or transmission: nanogauge 1 retracts, while nanogauge 2 extends. The electrical resistance of the nanogauges varies due to the piezoresistive effect. The acceleration or other value can be accurately reported by measuring this resistance variation differentially using a so-called Wheatstone bridge arrangement.



Key facts

- Multi-sensor technology
- Performance characteristics already demonstrated for 3-axis accelerometers and gyrometers, and pressure sensors
- More than 20 patents



Silicon nanowire sensitive devices offer many advantages compared with existing capacitive sensors in MEMS:

- Linear response while capacitive detection is very non-linear
- Less sensitivity to parasitic capacitances, which greatly simplifies electronic interface circuitry and assembly
- Better performance due to stress concentration in a very small gauge cross section.

Interested in this technology?

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