Hybrid silicon strain sensors (SiDMeses)

Force is an important measurand for various mechanical variables such as pressure, tension, torque, acceleration and mass. The fields of application are diverse, for example in force transducers, scales, pressure and torque transducers, but also in the stress analysis of structures such as bridges, dams and high-rise buildings.

Strain gauges made of copper-nickel-manganese alloys are often used in these applications. These have certain limitations due to their material properties. In contrast, strain gages based on semiconductors have a sensitivity that is 40 times higher and show a very high stability, but require more innovative mounting techniques on the substrates.

In the SIDMESES project, the long-term stability of hybrid sensors with Si strain gauges was improved by various measures such as the reduction of mechanical mounting stresses and a more precise structure in order to achieve high sensitivity to the measured variable of pressure and insensitivity to changes caused by the mounting stress.

CHARACTERISTICS

- Targeted and accelerated reduction of mechanical assembly stresses as well as precise, extremely parallel and symmetrical assembly

- Reduction in the ductility of the joining materials

- Variation of the position of the Si strain gauge, high sensitivity to the measured variable, insensitive to changes in the mounting voltage

- **Offset of the sensor without load:** $< \pm 5$ mV/V

- **Measuring range:** ± 30 mV/V

- **Temperature coefficient Offset:** < 0.5 % F.S./10K

- **Short-term stability 24h at 130°C:** < 0.05 % F.S.

- **Temperature hysteresis:** 30°C-130°C -30°C: 0.1 % F.S.

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