Abstract: We have developed sensors suited for the measuring of inclination and acceleration with a very high sensitivity. Data can be extracted by means of the capacitive transducing effect. A single sided interdigital electrode arrangement on a solid was used. Changes of the capacity due to mechanical forces can be detected by changes in the permittivity above the electrodes only in this case. Changes of permittivity can be achieved by movable conductive particles insulated by a surrounding substance. This special task was taken by a membrane of PDMS containing small spheres of stainless steel in a disordered derivation. The membrane was arranged above the electrodes and held by columns of PDMS to define the distance between the solid and the membrane. Mechanical forces cause changes in the permittivity due to moving spheres. Changes can be measured and assigned to the type of deformation by a sophisticated electrode structure. Sensors of this type are simple and robust under harsh conditions.