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A Quasi-Concertina Force-Displacement MEMS probe for measuring Biomechanical properties

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Highlights:

- Development, fabrication, and characterisation of a multi beam novel Quasi-Concertina (QC) microelectromechanical systems (MEMS) sensor
- Force - Displacement (F-D) sensor with a resolution as small as 5.6 nN and 1.25 nm and a range of as much as 5.5×10^{-3} N and 1000 μm
- Novel highly linear self-sensing achieved by positioning polysilicon piezoresistors in a full Wheatstone bridge configuration over multiple beams

Abstract

In this work the development of a novel Quasi-Concertina (QC) microelectromechanical systems (MEMS) force - displacement (F-D) sensor is presented. The developed sensor has a resolution as small as 5.6 nN and 1.25 nm and a range of as much as 5.5×10^{-3} N and 1000 μm . The performance of the microfabricated proof-of-concept QC MEMS device is in good agreement with our analytical and numerical estimates. Force sensors with these attributes will enable the mechanical properties of biological phenomena to be continuously measured over large F-D ranges without the need to change the

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