

Triaxial Thick Film Load Cell*

Damiano Crescini, Vittorio Ferrari, Daniele Marioli
and Andrea Taroni

Department of Electronics for Automation, Faculty of Engineering, University of Brescia
Via Branze 38-25123 Brescia Italy

(Received October 12, 1992; accepted January 29, 1993)

Key words: load cell, force transducer, thick-film-technology sensor

Misalignment between sensing and force application directions can be a source of error in monoaxial load cells. On the other hand, different examples of multicomponent cells are reported in the technical literature. This paper describes a force-sensitive planar structure functioning as a triaxial load cell, where the electrical signals proportional to the orthogonal components of the load are generated by three independent thick-film estensimetric Wheatstone bridges. The theory of operation of the proposed cell is presented with a description of its implementation in thick-film technology on ceramic substrates and with experimental results of its characterization. It is shown that, by proper control of the fabrication process, good linearity and low crossed sensitivities can be achieved. In addition, the three bridges' signals may be electronically composed into a single output which is proportional to the magnitude of the applied force, independent of its direction. In this regard some results are reported, obtained with both analog and digital elaboration circuitry. For a given applied load, the variations in the output due to changes in the load application direction are shown to be negligible.

1. Introduction

Estensimetric load cells are widely used for force measurements. Differences exist in manufacturing technologies, intended applications, performance and cost; however, a common functioning principle relying on a mechanical elastic structure

*Work partially supported by C.N.R. Progetto Finalizzato Trasporti.