

Accepted Manuscript

On The Design and Analysis of an Octagonal-Ellipse Ring Based Cutting Force Measuring Transducer

M.S. Uddin, Dong Songyi

PII: S0263-2241(16)30122-1

DOI: <http://dx.doi.org/10.1016/j.measurement.2016.04.055>

Reference: MEASUR 3992

To appear in: *Measurement*

Received Date: 6 January 2015

Revised Date: 16 March 2016

Accepted Date: 25 April 2016

Please cite this article as: M.S. Uddin, D. Songyi, On The Design and Analysis of an Octagonal-Ellipse Ring Based Cutting Force Measuring Transducer, *Measurement* (2016), doi: <http://dx.doi.org/10.1016/j.measurement.2016.04.055>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



On The Design and Analysis of an Octagonal-Ellipse Ring Based Cutting Force Measuring Transducer

M. S. Uddin^{1,*} and Dong Songyi¹

¹School of Engineering, University of South Australia, Mawson Lakes, SA 5095

*Email: Mohammad.Uddin@unisa.edu.au

Abstract

This paper presents study of design, modelling, and analysis of a modified octagonal ring based cutting force measuring transducer. The shape of an octagonal ring was modified by altering the geometry of the circle into an ellipse. The main objective is to increase the strain to the displacement ratio under a given load so that the sensitivity is maximized.

Analytical and three-dimensional (3D) finite element (FE) methods were deployed to estimate mechanical responses such as strain, displacement, and stress of the transducer. Results showed that compared to the octagonal ring with circle, the modified octagonal ring with ellipse had maximized the sensitivity by 15% and 25% in axial and tangential loading, respectively.

In order to assess the performance of the designed transducer, calibration tests were performed on an Instron machine under axial and tangential loading and cross-sensitivity of force measurements was analysed. Following the ISO 376:2011 standard, an extensive uncertainty evaluation was performed to validate the measurement process used in the calibration.

Calibration results showed that the force transducer with the proposed octagonal-ellipse ring was able to measure the force with average error less than 2%. The maximum average error

Download English Version:

<https://daneshyari.com/en/article/7123406>

Download Persian Version:

<https://daneshyari.com/article/7123406>

[Daneshyari.com](https://daneshyari.com)