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Lumped-Parameter Inertia Model for Flexure Hinges

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ABSTRACT

The article describes the analysis to derive the lumped-parameter inertia properties for variable cross-section flexure hinges for potential use in modeling, designing, and optimizing of these components in the resonant/dynamic range. Inertia fractions corresponding to one of the flexure's 6 degrees of freedom are formulated for single-, two-, and multiple-axis flexure hinge configurations in a unitary fashion by utilizing the Rayleigh principle. Closed-form solutions are not always available for all flexure types that are defined longitudinally by means of analytical curves, but numerical integration can readily be applied to solve for the lumped-parameter inertia fractions. The model yields at limit the known inertia fractions for a constant cross-section flexure hinge. Further

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