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Abstract: Modelling of the cutting forces in micromilling is challenging due to the size effect and existence of a minimum chip thickness. This paper presents the development of a cutting force model for micromilling of brass. The prediction of cutting forces derives from a simplified orthogonal process. A finite element (FE) model is employed to simulate two-dimensional cutting forces in orthogonal micro cutting, with the ploughing and tool edge effect taken into consideration. The flow stress of workpiece material is modelled by using the Johnson-Cook constitutive material law. The FE model is used to evaluate the critical chip thickness and to extract the cutting force coefficients. The cutting force coefficients are modelled as a function of instantaneous uncut chip thickness, which is independent of cutting speed but influenced by tool edge radius. To rectify the issue of sharp increase of the force coefficients under very small uncut chip thickness, a critical uncut chip thickness