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Composition du Jury

Civilité	Nom	Prénom	Grade / Qualité	Rôle
M.	BIBOULET	Nans	Maître de conférences	co Directeur de thèse
MME	GUINGAND	Michele	Maître de conférences	Examinateur
M.	MARÉ	Jean-Charles	Professeur des Universités	Rapporteur
M.	NELIAS	Daniel	Professeur des Universités	Directeur de thèse
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Résumé

Roller screws are highly efficient rotation-translation converters used in a variety of industries. Despite its numerous advantages, the mechanism remains complex and rather difficult to understand due to the limited amount of available research and the restrictive assumptions made in current literature. The main goal of this thesis is to quantify the power dissipated by standard and inverted roller screws, which is an important result for any study related to efficiency or temperature distribution. The memoir starts with a basic geometric analysis of the mechanism which attempts to generalize threaded surface equations for different types of profiles and backlash conditions. The contact point locations are then determined using a very fast algorithm and the shape, size and orientation of the roller-screw and roller-nut contact ellipses are deduced. It is shown that the principal directions of curvature obtained here by differential geometry are different from the ones assumed by previous research. Next, the mechanism kinematics is investigated using a stationary model, which allows a simplified calculation of the sliding velocity field at any point within the contact areas. The local motion proves to be a combination of spin and uniform sliding. The model is set to have only one degree of freedom in the form of a slip ratio, which depends on lubrication conditions and force balance equations. An experimental setup is designed to measure this ratio, yielding results which are very close to ideal operating conditions. Finally, a numerical force model is developed, which calculates the power dissipated during the steady-state regime. A parametric study is conducted to identify the important factors in efficiency and power dissipation, pointing out the lubricant as the most influential variable in terms of improvement.