The present work deals with the influence of the static and sliding force of friction and wear by means of ultrasonic vibrations. In contrast to studies by other authors, the influence of the normal force and the geometry of the contact area of the oscillating body have been studied. For each geometry and normal force, there exists a characteristic length. A significant influence of vibrations can be reached when the vibration amplitude exceeds this characteristic length. From the theory of both normal and tangential contact, it follows that this characteristic length is on the order of magnitude of the indentation depth, which thus becomes the most important governing parameter for the active control of friction by vibrations. In influencing the sliding frictional force with ultrasound, which was also investigated in this work in a wide range of normal forces, the indentation depth could be identified as a determining parameter in the description of the reduction mechanism of the frictional force.

The second part of this work is devoted to theoretical and experimental investigation of wear and surface modification under the influence of ultrasonic vibrations. Specifically, a sliding contact between a ball-pin made of steel and a rotating disk of different materials was considered. Among other things, it was found that the influence of oscillations on friction and wear is qualitatively different, which opens up new possibilities for the optimization of friction drivers and friction-based damping systems. Also, the properties of the deformation and wear of the rotating disk are affected by the ultrasound. Here, further studies are needed.