The principal aim of this Thesis is the construction of a cryogenic setup for the investigation of quantum turbulence in superfluid helium (He II) using microresonators and a to perform a study of the transition to turbulence in oscillatory flow of He II in the temperature range from 2.170 K down to 1.293 K. We have designed and constructed a setup consisting of a superconducting vibrating microwire and a so-called fountain pump, and, after initial testing and characterization, used it to probe the instabilities occurring in the flow of He II. Specifically, we were interested in the origin of the instabilities in the flow around the microwire and in the question whether they originate mostly from classical-like flow of the normal component, as is often the case with the well-known tuning forks, or whether they are related to the generation of quantized vortices in the superfluid component of He II. To distinguish between these two types of instabilities, we have derived from the Navier-Stokes equations scaling laws related to drag forces in classical oscillatory flow, which we have applied to the normal component of superfluid helium. This also enabled us to verify the validity of the high-frequency limit of oscillatory flow for the case of the microwire. Finally, we have examined the capability of the microwire resonator as a detector of an external stationary flow generated by a fountain pump, and our positive results hint at the application possibilities of such superconducting microwires or similar devices in the future.