In this paper an anisotropic dry friction force law allowing for non-convex force reservoirs is formulated using tools from convex analysis and the frictional behavior of an anisotropic surface is studied experimentally. While conventional set-valued force laws have the capability to describe the non-smooth behavior of stick and slip, they are limited to convex friction force reservoirs. Since theoretical considerations and experimental results indicate the existence of non-convex force reservoirs, we present a normal cone inclusion force law with two independent sets which enables the use of non-convex star-shaped force reservoirs. A stability analysis proves that the force law is capable of causing anisotropic friction induced instability. The described force law with the experimentally determined data results in an accurate representation of anisotropic frictional behavior.