This paper addresses the problem of state estimation in nonlinear Lagrangian dynamical systems with frictionless unilateral constraints using the position measurement as output. The discontinuous velocity variable in such systems is modeled as a function of bounded variation (so that Zeno phenomenon is not ruled out). Since the derivative of such functions is represented with the Lebesgue-Stieltjes measure, the framework of measure differential inclusions (MDIs) is used to describe the dynamics. A class of estimators is proposed, which also uses the framework of MDIs, and is shown to generate asymptotically converging state estimates. The existence and uniqueness of solutions for the proposed estimators is rigorously proven. The global stability of error dynamics is analyzed using the generalized Lyapunov methods for functions of bounded variation. As particular cases of our estimators, we provide an explicit construction of a full-order observer, and a reduced-order observer.