The need to perform on-site diagnosis tests of clinical and environmental relevance has triggered the development of point-of-care biosensors. The cheaper and user-friendlier they are, the better their chances will be to make it to the market and serve a purpose on the community. Paper-based biosensors are excellent candidates to accomplish these requirements. Moreover, they can be easily modified with bioreceptors. On the other hand, the strengths of electrochemical biosensors are their high sensitivity, low limit of detection and the possibility to obtain quantitative results. Laser-reduced graphene oxide (rGO) electrodes stamped onto a paper substrate were fabricated in order to merge the beneficial features of both materials – nitrocellulose and GO – within a biosensor. The platform is compatible with different labels with different electrochemical properties. Additionally, the use of a miniaturized potentiostat with Bluetooth connection for smartphone readout adds to the point-of-care capabilities of this biosensor.