

## **ABSTRACT**

There are 2 main problems with electric vehicles, such as long battery charging times and differences in voltage and capacity between brands that cause variations in battery dimensions. The swap and multiplug system is designed to overcome the problems by using a maximum power capability of 1200W (100V, 12A), limited to 10A to reduce the risk of overheating. The system features four Gesits brand battery rooms and a multiplug that can charge 48V, 60V and 72V batteries. Fast charging takes about 2 hours, using a three-stage charging protection method, starting from pre-charge (charging with 700mA current to the minimum voltage limit), constant current (charging with a constant current of 10A to 69.02V), and constant voltage (current drops slowly to 300mA, then disconnected). The system is equipped with a user interface for monitoring the battery conditions during charging, as well as a flood protection and payment system. Tests using Gesits and ECGO batteries showed a charging time of about 2 hours, faster than using chargers from each brand (3-4 hours). The multiplug system successfully charged batteries with different ports, and the comparison of voltage and current between the user interface and multimeter and clampmeter showed an average accuracy value of 98%. Thus, this swap and multiplug system offers an effective solution to solve the charging and battery compatibility issues of electric vehicles, while maintaining safety, efficiency, and charging accuracy, potentially solving the main problems in the widespread adoption of electric vehicles.

Keywords: Multiplug, three stage charging, Constant Current, Constant Voltage