

Evolution of EV systems

Electric powertrain “E-Axle”

EV system management unit “EMU”

Battery management system “BMS”

- “E-Axle” for two-wheel commuter EVs integrating a motor, a gearbox, and an inverter
- Further downsizing is realized by changing the layout.
- “EMU” that realizes after-sales software updates and function changes
- “BMS” that maximizes the performance of batteries dedicated to motorcycles



“E-Axle” is an electric powertrain system developed in-house that integrates a motor, a gearbox, and an inverter, which are indispensable for the electrification of motorcycles. At EICMA 2023, the unit realized further downsizing and weight reduction by eliminating the cooling fan, downsizing the gearbox, and mounting the inverter in the motor casing with the main aim of mounting it on lightweight motorcycles. At EICMA 2024, further downsizing has been realized by changing the layout of the inverter. We are also improving the natural cooling efficiency of the inverter and taking countermeasures against vibrations of E-Axle, resulting in enhanced market conformity.

The main feature of E-Axle is the compact package that integrates the motor, gearbox, and inverter. Its layout consists of proprietary technologies, including patented ones. E-Axle does not need a dedicated EV frame for mounting and can also be mounted on an existing frame for lightweight motorcycles with an internal combustion engine, so that the workload during vehicle development and manufacture can

be reduced. Furthermore, the compact design allows for a high degree of freedom in battery mounting space, and a wider space realizes a longer cruising range.

On the new E-Axle to be presented at EICMA 2024, the position of the inverter is changed. It is placed transversely with respect to the axial direction of the motor from under the powertrain. This makes it possible to embed a rotational angle sensor in the inverter, which contributes to further downsizing the unit. The number of parts has also been reduced. In addition, we have further enhanced market conformity by improving the efficiency of the natural cooling method for the inverter, which utilizes the wind generated when moving, and promoting countermeasures against vibrations of E-Axle while performing running tests on actual vehicles.

“E-Axle,” which was first announced by Astemo at EICMA 2022, was developed to be mounted on 110-cc to 125-cc class scooters by utilizing its characteristics of compactness, light weight, and high output. By adopting an on-board design, which mounts E-Axle on a frame, E-Axle has been given excellent handling stability and a high degree of freedom in styling and body layout, unlike in-wheel motors and side-wheel motors adopted by many small two-wheel EVs.

The improved version of “E-Axle” presented at EICMA 2023 has been further downsized and has a lighter unit for adaptation also to scooters with the main aim of mounting it on lightweight motorcycles in response to OEM needs.

In addition to the “EMU (EV system Management Unit),” which integrates the management functions of various electronic control systems essential for the handling stability and safety of motorcycles and can respond to functional changes simply by updating software, we continue to develop the “BMS (Battery Management System),” which is necessary for EV systems.

As the market for two-wheel EVs continues to expand, how to develop variations efficiently will become a challenge. The EMU Astemo is developing is an item that can contribute to developing variations of various two-wheel EVs with reasonable resources by updating software and realizing functional changes.

The BMS is equipped with a safety function to prevent overcharging and over-discharging of the battery cell and overcurrents at the output terminal besides battery monitoring functions, such as estimating the remaining level of charge and degree of degradation of the battery and the equalization of the cell voltage. Since Astemo’s BMS has already been adopted on many four-wheel xEVs, we have cultivated high-accuracy cell voltage detection technology and a failure detection function through this experience, and these enable us to maximize battery performance and extend the cruising range while securing safety.

*Information contained in this Technical Information is current as of November 5, 2024 but may be subject to change without prior notice.