

# Battery Wiring Module Available for Laser Welding

## 1. Outline

With the recent tightening of fuel consumption/emission control regulations, Zero-Emission Vehicle regulations, and other environmental regulations, the use of electrified vehicles (electric vehicles, plug-in hybrid vehicles, hybrid electric vehicles) is expanding. A motorized vehicle is equipped with a battery pack for powering electric motors. In the battery pack, multiple battery modules are connected to each other to produce high-voltage, high-capacity power. In the battery module, the electrodes of multiple laminated battery cells are electrically connected in series or parallel by the bus bars of a battery wiring module. A control unit is connected to the battery modules via the wires of the battery wiring module to monitor the voltage of each battery cell (Fig. 1).

Sumitomo Wiring Systems, Ltd. and AutoNetworks Technologies, Ltd., both in the Sumitomo Electric Group, have jointly developed a battery wiring module that can connect between battery cells by laser welding (Photo 1), thereby downsizing the battery module. The new battery wiring module was used in the Nissan LEAF e+ that was launched in the market in January 2019.

## 2. Features

Traditionally, battery cell electrodes are connected to the bus bars and voltage detection terminals by bolting. To make laser welding available for connecting between battery cells, we use an aluminum-copper clad metal to fabricate the bus bar of the battery wiring module. For the voltage detection circuit, we connect the bus bar and wires without using terminals (Photo 2). In this way, we have contributed to the downsizing of the battery module.

### 2-1 Clad metal bus bar for connection between battery cells

The electrodes of a lithium-ion battery are made of different materials. In particular, aluminum is used for the positive electrode, while copper is used for the negative electrode. Assuming a copper bus bar is used to connect between battery cells, it then becomes necessary to weld dissimilar metals of aluminum and copper by laser welding on the positive electrode side; as a result, the welded joint cannot assure the required strength.

As a solution to this problem, we prepare an aluminum-copper clad metal in advance and use it to fabricate the bus bar. This makes it possible to weld the same type of material on each battery electrode.

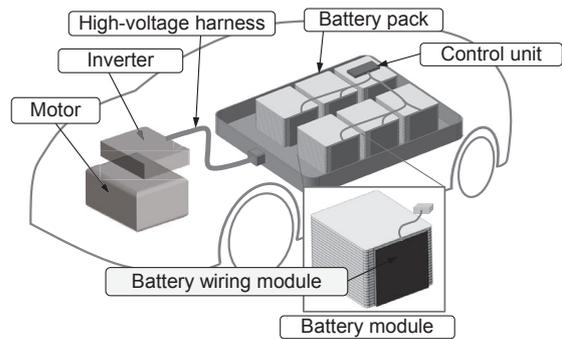


Fig. 1. Battery module and battery wiring module

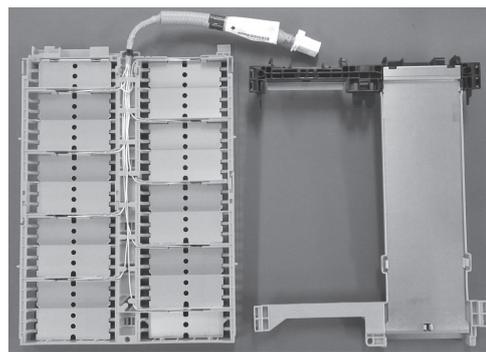


Photo 1. External appearance of battery wiring module

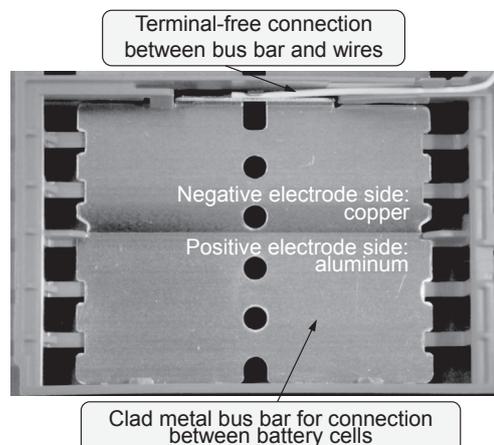


Photo 2. Clad metal bus bar for terminal-free connection

**2-2 Terminal-free connection between bus bar and wires**

We have developed a new joining technology that enables direct connection between the bus bar and wires without using terminals, thereby minimizing the space necessary for connecting the bus bar to the voltage detection circuit. This terminal-free connection technology has realized a more compact battery wiring module.