

# Direct Connector for Hybrid Automobiles to Improve Workability

## 1. Outline

Automobile industry is actively developing electrically driven vehicles such as hybrid vehicles in order to deal with the global warming problem caused by increasing CO<sub>2</sub> emissions in recent years. Hybrid vehicles have an internal combustion engine and also an electrical drive system that is mainly composed of a battery, an inverter, and motors. The vehicle selects itself the driving system which is appropriate for the driving situation at any particular time in order to greatly improve the fuel efficiency.

Direct connectors are integrated into the equipment and are suitable for inverter installation directly above the motor. It makes possible to form a cableless connection between the inverter and the two motors respectively used for driving and electricity generation (Fig. 1).

Sumitomo Wiring Systems, Ltd. has newly selected flexible conductors to develop a direct connector which connects the inverter, the motors and therefore improves assembling workability on automobile production lines (Photo 1). This product was selected to be used on the

Odyssey Hybrid, launched by Honda Motor Co., Ltd. in February 2016.

## 2. Features

Conventionally, inverters and motors on hybrid vehicles are placed separately within the engine room and connected to each other with electric cables. As a result of this, there were demands to improve the assembly workability technology by placing the inverter directly on top of the motor and connecting them using a direct connector.

### 2-1 Positioning pin for fitting

As an inverter is a heavy item, in order to install it directly on top of the motor and connect it to the motor, the inverter and the motor need to be fitted together with just rough alignment. To achieve this, we worked in cooperation with Honda R&D Co., Ltd. and successfully adjusted the profile of the positioning pin to fit and set the appropriate guiding margin (Fig. 2).

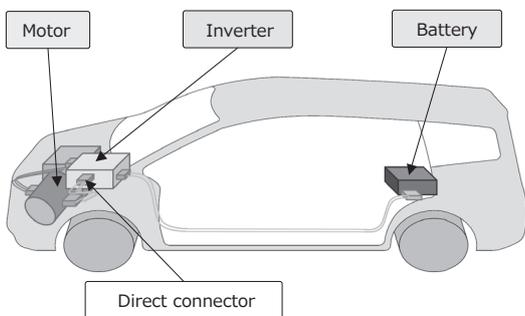


Fig. 1. A hybrid system and direct connector

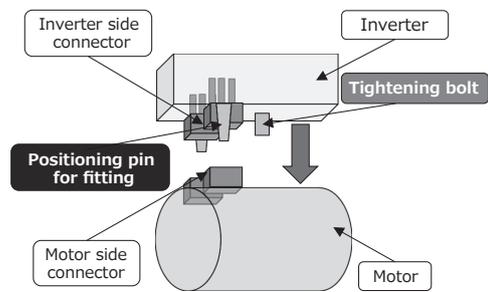


Fig. 2. Inverter and motor assembling manufacture

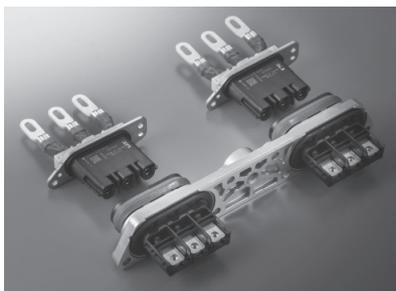


Photo 1. External appearance of direct connector

### 2-2 Floating structure

To support rough position alignment, we expanded the guiding margin on the motor side connector by developing the front opening profile. On the other side, we used flexible conductors inside the connector on the inverter side and adopted a floating structure. This created a structure that was self-aligning and could absorb the positional tolerance (Fig. 3).

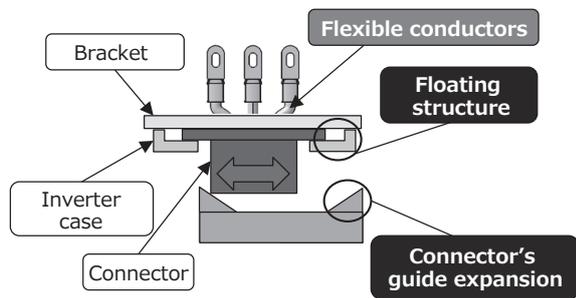


Fig. 3. Connector fitting

These features have made possible to fit two connectors with one motion and fasten it with just one bolt, thus the bolt tightening work was greatly reduced and the assembly workability was significantly improved.