

Power Cable for Hybrid Electric Vehicles

1. Outline

Aiming to counter the problem of global warming caused by the recent increase in CO₂ emissions, automobile manufacturers have actively devoted themselves to the development of hybrid and other types of electric vehicles. A hybrid electric vehicle combines an internal combustion engine and an electric drive train consisting mainly of a battery, inverter, and motors. The hybrid electric vehicle maximizes its fuel economy by selecting either the engine or electric drive train, depending on the running condition of the moment.

Power cables connect the inverter with two three-phase alternating current (AC) motors, one used for driving the vehicle and the other for generating electricity. Three large-diameter wires with large current capacity are used to power each motor (six wires in total). The connectors fitted to both ends of each cable allow easy connection to the inverter and motor. Reduction of size and weight of the power cable is always a requirement in order to downsize the drive train and thereby trim vehicle weight (Fig. 1).

Sumitomo Wiring Systems, Ltd. and AutoNetworks Technologies Ltd., both of which are Sumitomo Electric Group members, have jointly developed a new power cable (Photo 1) by introducing a six-phase integral molding technique and adopting a copper cloth shield. The power cables were first used in the Toyota Prius that was released in December 2015.

2. Features

2-1 Six-phase integral molding technique

The newly-introduced six-phase integral molding technique (Fig. 2) enables insert molding of six wires as a batch. Previously, a pair of power cable assemblies, each consisting of three large-diameter wires, were used. Each cable assembly was made by passing the three wires individually through a wire seal and connecting them to a molded plastic connector. Introduction of the six-phase integral molding technique enables the creation of water-tight wires without using wire seals and integrates two pairs of cables into one, thereby slimming the cable assembly to allow for installation even in limited spaces.

2-2 Copper cloth shield (Photo 2)

A cloth shielding material is used to solve electromagnetic problems of the power cable. The braided shielding material, which was used to cover a conventional power cable, makes it difficult to reduce the external dimensions of the cable. Use of a cloth shield for the new cable has

simplified its construction and reduced its external dimensions.

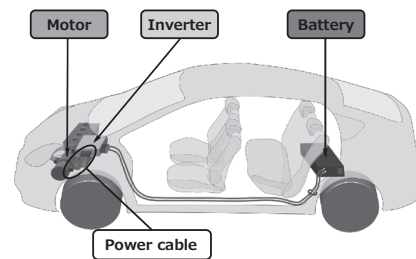


Fig. 1. Hybrid system and power cable

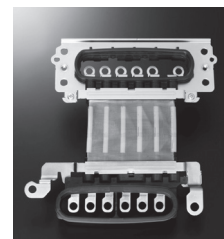


Photo. 1. External appearance of power cable

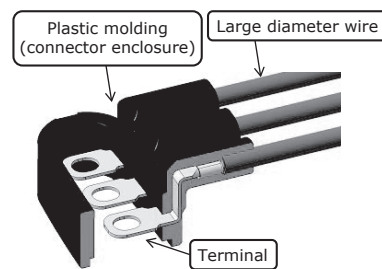


Fig. 2. Conceptual illustration of six-phase integral molding technique

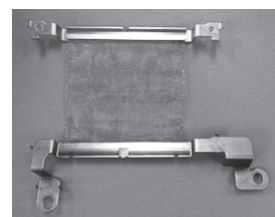


Photo 2. Copper cloth shield