

Backup Battery for X-By-Wire System

1. Outline

In recent years, there has been an increase in the demand for by-wire technologies for improved safety and convenience. Brake-by-wire and shift-by-wire technologies, which have been widely used, are essential for future self-driving cars. The market is expected to expand for them in the future.

However, as the by-wire-technology controls a device through electrical signals, a control failure occurs if the vehicle power source such as a lead-acid battery becomes out of order (Fig.1).

Sumitomo Wiring Systems, Ltd. and AutoNetworks Technologies, Ltd. of the Sumitomo Electric Group have developed an x-by-wire backup battery designed for uninterrupted by-wire control even in the event of a vehicle power failure (Photo 1).

The product was adopted by Toyota Motor Corporation for their Lexus UX300e launched in 2020.

2. Features

A DC/DC converter and energy storage devices (electric double-layer capacitors) are incorporated to ensure compactness, durability, and stable power supply (Photo 2).

2-1 Compact design

The number of energy storage devices was reduced using a bidirectional DC/DC step-up/down converter and efficiently controlling the voltage and current of electric double-layer capacitors.

2-2 Fifteen-year performance assurance

Use of long-life electric double-layer capacitors eliminates the need for replacement throughout the life of general vehicles (15 years). Moreover, performance degradation can be detected owing to the capability to detect degradation of energy storage devices.

2-3 Stable power supply

The capacitors can be charged in approximately 10 s owing to constant-voltage charging provided by the DC/DC converter. After charging, constant-voltage output avoids instantaneous interruption of the x-by-wire function.

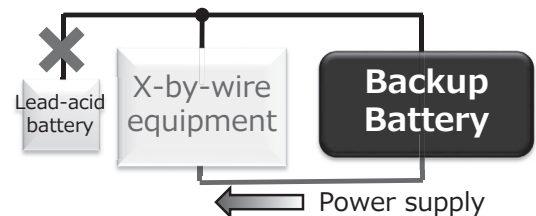


Fig. 1. X-by-wire equipment and backup battery

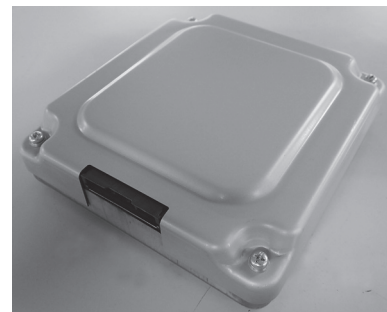


Photo1. Exterior of x-by-wire backup battery

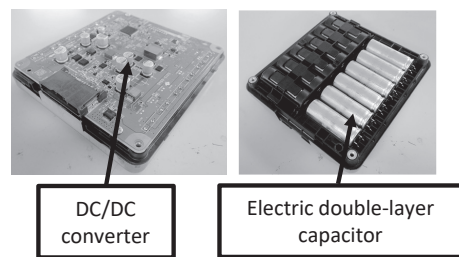


Photo 2. Internal circuits and energy storage devices

Table 1. Specifications

Stored energy	0.47 Wh max.
Output power	200 W
Operating temperature range	-30°C to 65°C
Storage temperature range	-40°C to 85°C
Outside dimensions	150×140×40 mm
Weight	800 g