Battery cell monitoring with Dukosi C-SynQ® is synchronous and deterministic by design

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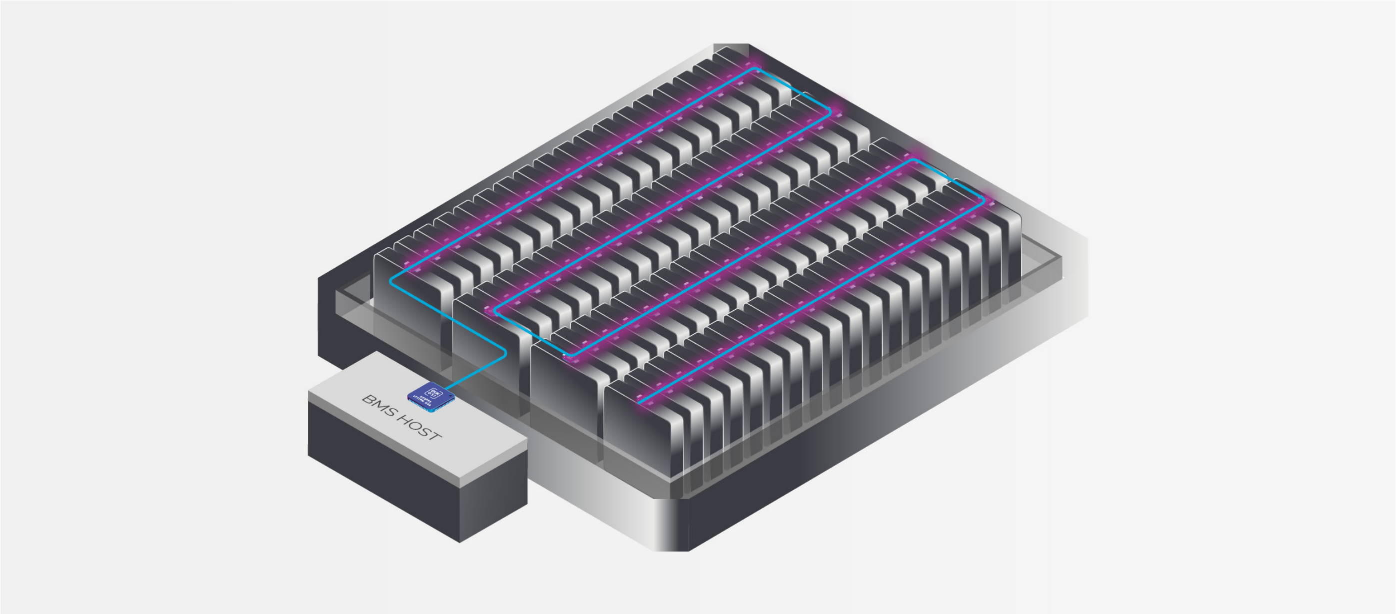
Rapid advances are being made in the technology governing high-power battery systems, which is helping to accelerate the advantages of electrifying industries such as electric vehicles, and battery energy storage. However, it is a complex task to design an optimal, reliable, and safe high-power battery pack; it must incorporate both a high-voltage system of cells that store and deliver power, and a separate low-voltage system of sensing and communication of each cell's status to the battery management system (BMS) host. There can be 100s of cells in a high-power battery pack, and the status of every one must be captured **synchronously** in a single snapshot, multiple times a second, with each snapshot being relayed to the BMS host with **deterministic** latency to achieve optimal performance. This ensures that the BMS host has an ongoing complete and reliable dataset that it can use to accurately estimate the State of Charge (SoC), and State of Health (SoH).



However, the situation in real-life applications is anything but smooth and steady. For example, an electric vehicle must react to the driver's acceleration and braking. Even advance safety features like traction control can put sudden, rapidly changing demands on the battery. If cell monitoring is not synchronous and deterministic, the BMS will receive data from first to last cell in different states, so it's view of the whole battery is distorted, which induces compounding errors into State of Charge (SoC) and State of Health (SoH) estimates. Therefore, capturing reliable, accurate, synchronous cell data and delivering it deterministically to the BMS host is a crucial prerequisite to maximizing the performance and safety of a battery pack.

Study shows: More accurate cell data = more accurate State of Charge

Our white paper[1] – Sensitivity of Lithium-Ion Battery SoC Estimates to Sensor Measurement Error and Latency – investigates the impact on the performance of SoC and SoH estimation based on the integrity and quality of cell measurements. It considers typical usage scenarios in electric vehicles and ESS applications, as well as cell chemistry, estimation method, and measurement performance; while measuring cell temperature, cell voltage and cell current. Using quantitative methods, the study finds that more accurate and synchronous cell sensing enables better SoC and SoH results.

> One of the key concerns in marine applications is safety. Dukosi's battery architecture uniquely provides per-cell temperature sensing that improves safety compared to legacy systems, by giving us greater real-time insights into every cell's behavior, while also allowing us to accelerate DNV certification. **Their chip-on-cell technology with C-SynQ® simplifies integration into our battery systems**, while also providing valuable design flexibility, allowing us to streamline production to meet tight deadlines with confidence.
>
> Kay Henning Higraff, CEO, Nordic Marine Power

Accurate, reliable contactless cell monitoring

The Dukosi Cell Monitoring System (DKCMS) offers best-in-class, highly accurate 24/7 cell monitoring. Since Dukosi Cell Monitors are typically placed closer to the cell terminals with consistent sense lead lengths, they record highly accurate voltage data that is robust to EMI disturbances. This enhances the quality and accuracy of cell data gathered, which can directly reduce SoC and SoH estimation errors, thereby improving the quality, reliability and trustworthiness of SoC and SoH information.

These advancements lead to significant benefits for various applications, such as more accurate range estimates in electric vehicles and increased battery value in Battery Energy Storage System (BESS) installations. With a more precise understanding of available energy and cell lifespan, implementing Dukosi's cell monitoring technology can improve SoC estimation accuracy, resulting in over a 20%[1] improvement in usable energy per cell.

Furthermore, this technology supports the circular economy by enhancing the trustworthiness of SoH readings at the end of a battery's first life. This allows companies specializing in next-life applications to confidently reuse cells and resell them with assurance.

Whereas other battery architectures – wired or wireless – can require significant design and validation time and cost to achieve deterministic integrations, DKCMS can work with 20, 50, 100, or 200+ cells of any shape, layout, capacity or even chemistry without additional design overhead. The unique near field network that connects every Cell Monitor, while Dukosi C-SynQ®, a proprietary communication protocol designed specifically for large networks in safety-critical environments, communicates data synchronously with deterministic latency in virtually any battery configuration. This ensures no disparity in readings, especially when the cells experience sudden voltage transients, improving data accuracy. In rapidly changing industries and market demands, a cost-effective, flexible and scalable battery architecture offers a significant advantage to help a battery design team stay nimble and adaptable. Achieve more with Dukosi in your next battery design.

[i]. https://www.dukosi.com/blog/sensitivity-of-lithium-ion-battery-soc-and-soh-estimates-to-sensor-measurement-error-and-latency