Application Note

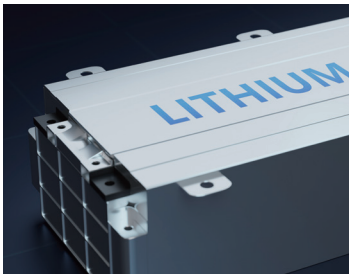
YOKOGAWA
Co-innovating tomorrow™

Multi-point High Withstand Voltage and High Speed Cell Voltage Measurement

(for charge and discharge testing and aging process of secondary batteries)

Current Situation and Challenges

Growing demands for cell voltage measurement driven by secondary battery performance improvements



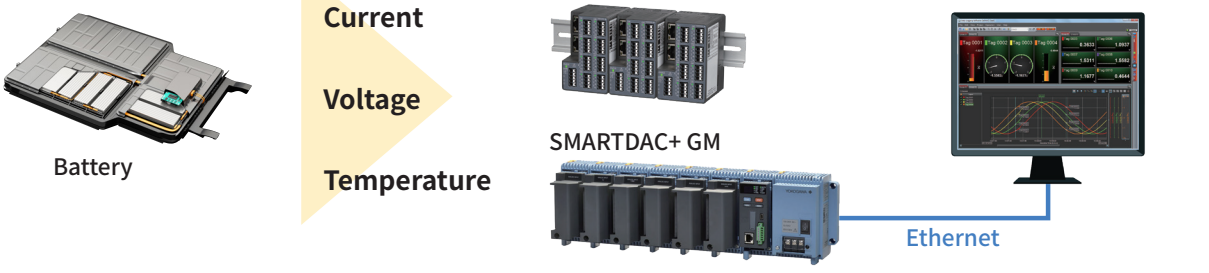
In recent years, as battery performance continues to improve, accurate and safe evaluation during the inspection process has become essential to maximize their performance and ensure reliability. In this inspection process, the current, voltage, and heat generation of cells are measured during repeated charge and discharge cycles to evaluate their characteristics. Additionally, cell voltage measurement is performed to monitor ambient temperature and discharge characteristics during aging process.

Furthermore, with the increase in battery capacity, multi-point measurement is required to inspect a large number of cells and modules simultaneously. In particular, when multiple cells are stacked in series, the common mode voltage increases, requiring measurement equipment with high withstand voltage capabilities. Moreover, accurately evaluating transient responses requires high-speed and high-precision measurement capabilities.

Yokogawa's Solutions

Accurate and safe battery evaluation with multi-point high-voltage, high-speed cell voltage measurement

Yokogawa provides optimal measurement equipment for cell voltage measurement during charge and discharge testing, as well as aging processes. For large-scale measurements with a large number of cell layers, the SMARTDAC+ GM data acquisition system is ideal, offering high withstand voltage capabilities and multi-point data collection. For measurements requiring space savings and high-speed sampling, we offer the ultra-compact multi-sensing remote I/O analog sensing unit VZ20X. These devices are capable of collecting various analog signals such as current, voltage, and temperature, and their excellent noise resistance enables accurate and safe measurements. We also offer software that allows you to easily monitor the collected cell voltages.



Advantages of SMARTDAC+ GM and VZ20X

SMARTDAC+ GM: Ideal for large-scale measurements

SMARTDAC+ GM is a data logger with a block structure that allows you to easily combine the necessary modules, offering excellent versatility, scalability, and ease of maintenance. It is suitable for cell voltage measurement in applications with a large number of stacked cells and high common-mode voltage, with synchronized measurement of up to 420 channels and basic insulation performance up to 1,000 V.

VZ20X: Suitable for space-saving and high-speed measurement

The VZ20X is an analog sensing unit that is smaller than a business card and lightweight, making it one of the smallest in the world. One-unit measures multiple types of analog signals such as current, voltage, and temperature. This is ideal for systems that require high-speed measurement and space savings, with sampling speeds of up to 1 ms and 120 synchronized measurements.

Easy cell voltage monitoring with GA10

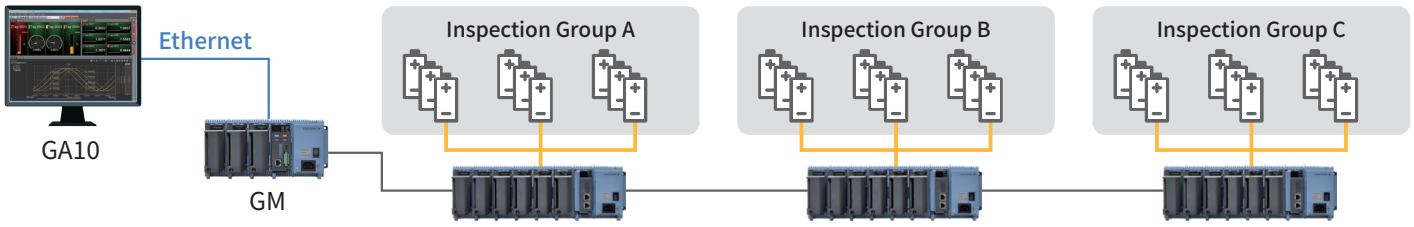
GA10 is PC-based data logging software. It can connect to up to 100 devices and handle up to 10,000 tag data points. This makes it easy to monitor and process data without the need for program creation or complex settings.

	 GM	 VZ20X
Maximum measurement point & sampling intervals		
	420 points (Scan Interval 100 ms or more) 32 points (Scan Interval 10 ms) 5 points (Scan Interval 1 ms)	120 points time synchronization (8 points per unit, up to 15 units) 1ms sampling
Input types		
	DCV (direct current voltage) TC (thermocouple) RTD (resistance temperature detector) DI (Contact or TTL) mA (direct current)	DCV (direct current voltage) TC (thermocouple) RTD (resistance temperature detector)
Measurement accuracy (DCV)		
	0.05% of rdg	0.025% of FS (when the filter is on)
RJC accuracy		
	±0.5°C (ambient temperature 23±2°C)	±2°C (ambient temperature 23±2°C)
Maximum voltage between channels		
	300VAC/DC	300VAC/DC
Common mode maximum voltage		
	600 VAC/DC (double insulation) 1000VDC (basic insulation)	300VAC/DC
Data storage		
	Internal memory External media (SD/SDHC)	Data is saved to a PC or similar device via Ethernet communication.
Dual sampling		
	Available	Not available

Solution Implementation Image

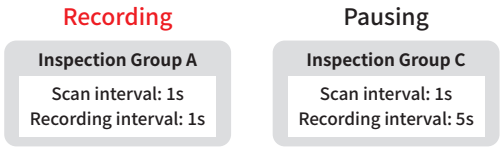
Group-specific aging measurement of EV batteries

The voltage and temperature of multiple batteries are measured for each inspection group. SMARTDAC+ GM is used to measure voltage and temperature. It accurately and safely collects data from multiple points. The measured cell voltage can be measured and recorded at separate timings for each group using the GA10 data logging software.



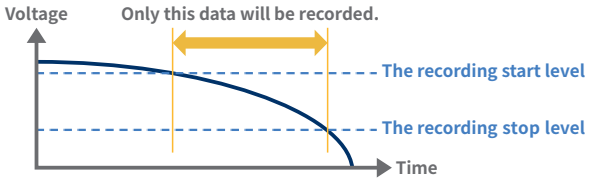
Multi-data collection

It is possible to collect and record data independently for each group.



Measurement and recording at individual timings

Recording can be started and stopped based on predefined measurement thresholds, allowing only the necessary data to be recorded.



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