

OpreX Battery Web Gauge ES-5 for Battery Electrode Sheets

As the adoption of electric vehicles (EVs) and energy storage systems (ESSs) advances in order to realize a sustainable society, the production volume of secondary batteries, including lithium-ion batteries, is expanding. While demand is increasing, the following issues have been identified as challenges in the secondary battery market.

- Reduction of CO₂ emissions in the supply chain
- Monitoring and improvement of manufacturing quality to prevent and mitigate fire accidents
- Enhancement of production efficiency

The ES-5 has been designed by integrating knowledge of battery manufacturing processes accumulated over many years with Yokogawa's strengths in measurement, control, and information technologies, thereby contributing to resolving secondary battery challenges.

MAIN FEATURES

The ES-5 addresses challenges by providing value in three key areas.

■ Reduction of Environmental Impact

As shown in Figure 1, the ES-5 has a completely redesigned structure. Unlike the conventional robust welded construction, the new design is based on a single base plate, achieving a more compact and lightweight device (approximately one-third the weight of previous models). This not only reduces the amount of raw materials used for the frame but also enables a shift from conventional wooden crates to cardboard packaging for export, thereby contributing to the reduction of packaging waste.

The control box can be installed with a high degree of freedom, either on the opposite side of the frame or separately. This design supports the creation of a more compact production line by optimizing space utilization. In addition, compared with conventional models, the ES-5 consumes approximately one-third of the power with nearly zero air consumption, contributing to lower CO₂ emissions in the factory.

A standard aluminum frame is used for the device structure. Unlike a conventional welded construction, the unit can be easily disassembled, reused, or disposed of when no longer in use.

In this way, the ES-5 contributes to reducing environmental impact from manufacturing, transportation, operation, and disposal.

■ Safe and Secure Battery Manufacturing

The sensor structure has also been completely redesigned, achieving a beta-ray irradiation window slit width of 5 mm and enabling the selection of a 0.5-mm measurement pitch. This allows for high-resolution measurement of coating edges and other areas critical for quality control. Furthermore, reducing the sensor weight has made higher scanning speeds possible, thereby reducing the risk of overlooking quality variations.

In addition to conventional temperature correction, the newly added barometric pressure correction enables measurements that more closely follow environmental



Figure 1 The ES-5

changes, thereby extending the intervals between automatic calibrations.

In addition, the incorporation of a new profile noise reduction filter has enabled rapid profile stabilization, requiring less than half the stabilization time compared with conventional models. These features allow for longer measurement times than before, helping to reduce material loss and supporting the stable operation of factories.

The measurement range has been expanded to a maximum of 2,000 g/m². This enables the measurement of a wide variety of materials and thicknesses, supporting the development and manufacturing of next-generation batteries.

■ DX in Battery Manufacturing

The ES-5 is compatible with Yokogawa's proprietary coating automation control software, which helps shorten the convergence time to optimal product quality and improve yield, thereby enhancing production efficiency. Additionally, the system offers a more flexible operation and monitoring interface, enabling the proposal of a monitoring environment that meets the user's needs.

Yokogawa's information integration server, the "CI Server," has been adopted as the platform. This enables flexible construction of data linkages with peripheral equipment and core information systems.

MAIN SPECIFICATIONS

■ Frame

Overall frame length: 1,654 mm (short length) or 2,454 mm (long length)

Maximum measurement width: 800 mm (short length) or 1,600 mm (long length)

Maximum number of measurement points: 1,600

Measurement pitch: Select from 0.5 (short frame only), 1.0, 2.0, 2.5, 4.0, 5.0, and 10.0 mm

Supported sensor: Beta-ray detector (radiation source: ⁸⁵Kr)

Number of sensors mountable: 1

Sensor head speed during scanning: 3 to 36 m/min

Permissible frame tilt angle: ±10°

■ Sensor

Measurement method: Beta-ray transmission method

Measurement range: 0 to 2,000 g/m²

Radiation source container: Rotary shutter type

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