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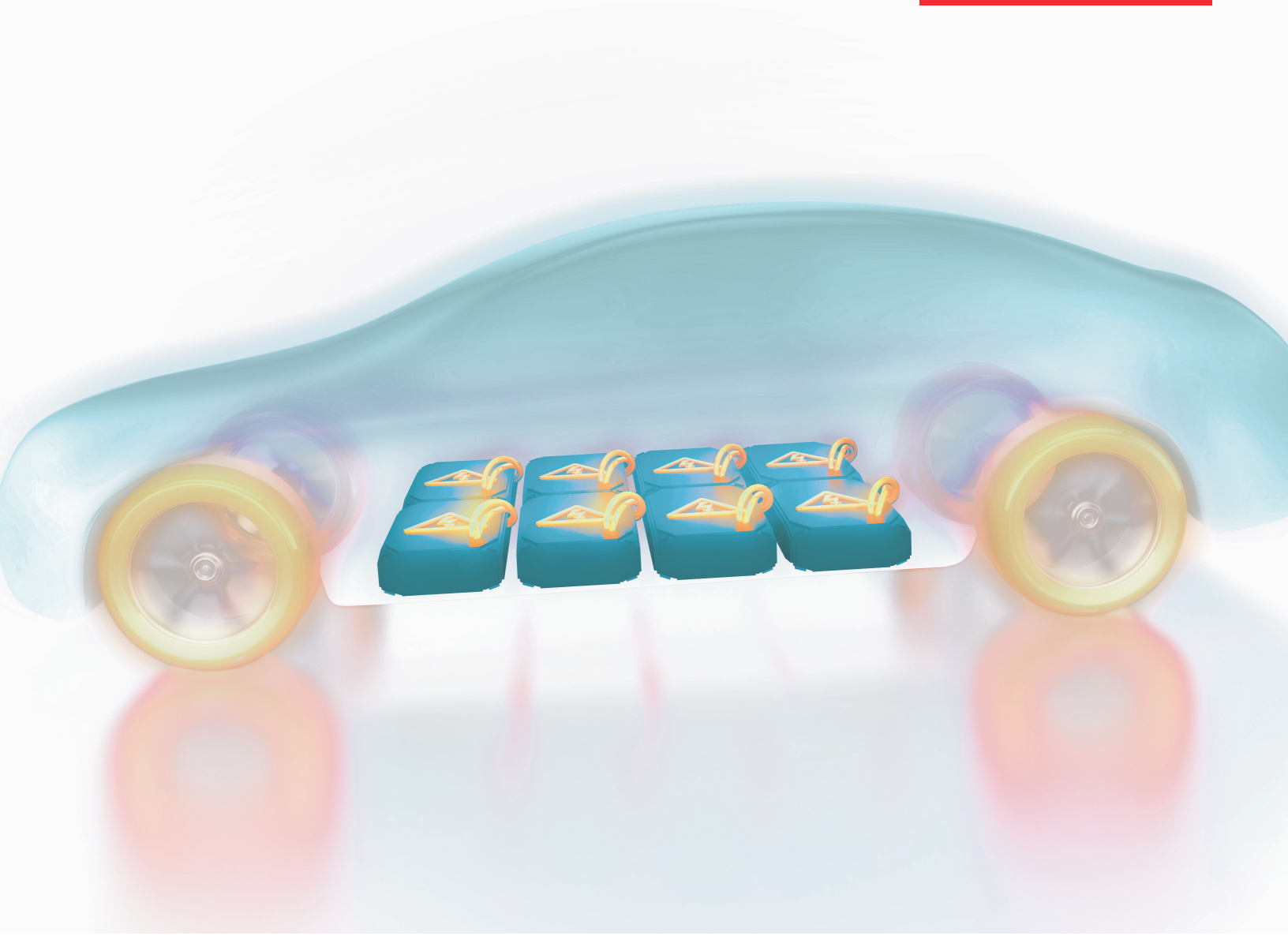

LInspector measurement and control system

In-line lithium-ion battery quality control

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LInspector measurement and control system

Lithium-ion has become the battery chemistry of choice for electric and hybrid vehicles. However, manufacturing these batteries is an expensive and challenging operation. Thermo Scientific LInspector Measurement and Control System addresses the need for accurate electrode coating weight measurement, multilayer thickness measurement of separator films and electrode calendering thickness measurement. Its combination of sensor accuracy and reporting capabilities improves the safety and consistency of lithium-ion batteries and ensures efficient production of high-quality and reliable products.

LInspector measurement and control system

Solutions for lithium-ion battery

Thermo Scientific™ LInspector™ measurement and control system has been specifically designed to address the need for accurate electrode coating weight measurement, multilayer thickness measurement of separator films, and electrode calendering thickness measurement.

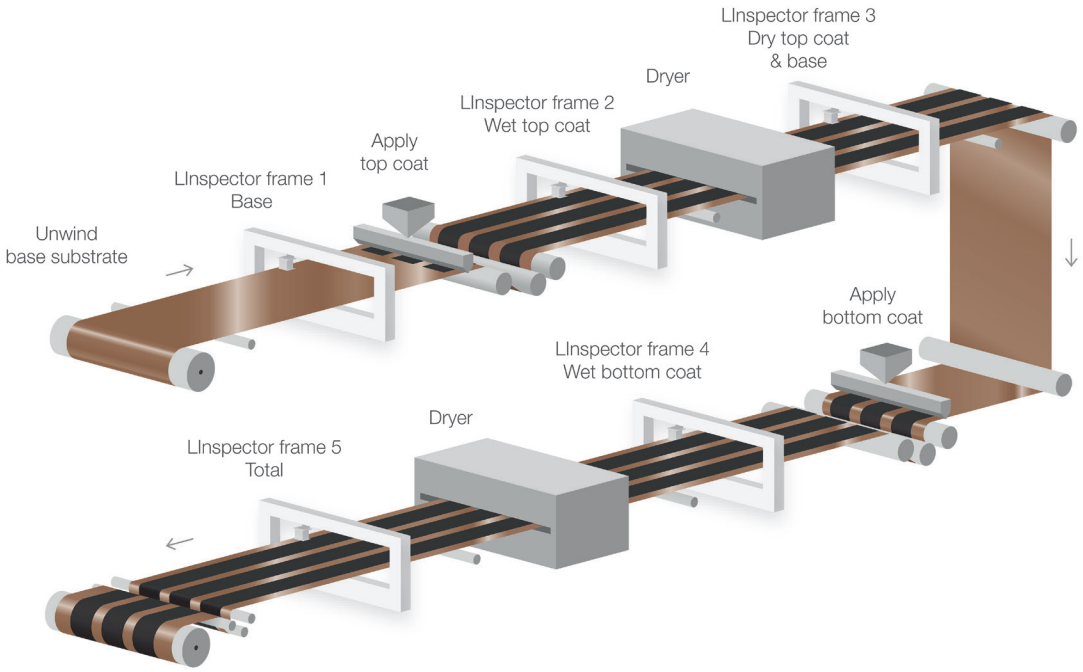
Building on 80 years of gauging measurement excellence, the LInspector measurement and control system combines innovations in sensor, measurement, reporting, and remote instrument health monitoring capabilities that help manufacturers to improve the quality, speed, and efficiency of lithium-ion battery production. Enabling the detection of more defects, saving waste and improving product robustness.

Applications

- Separator films
- Anode and cathode coating
- Anode and cathode calendering

Separator films can be coated with materials such as ceramic to improve efficiency and safety. Coating on an aluminum (cathode) or copper (anode) substrate is a challenging operation, yet uniform coating is critical to avoid defects and failures of the battery. Accurate coating measurement and control on both sides of the substrate ensures raw material savings, improving yield and quality.

The final process step sees the coated electrode material calendered for homogenous thickness and particle size. Calendering improves electrical contact, adhesiveness and assures the desired characteristics. Coating thickness measurement and calender control are critical to ensure final dimensional accuracy.



End-to-end coating process monitored and controlled at all stages

See more, waste less

Greater coverage, speed, and resolution

The new LInspector in-line measurement and control system is part of our wider commitment to the clean energy industry and ensures superior battery quality and process efficiency, allowing manufacturers to confidently deliver high-quality lithium-ion battery products at scale.

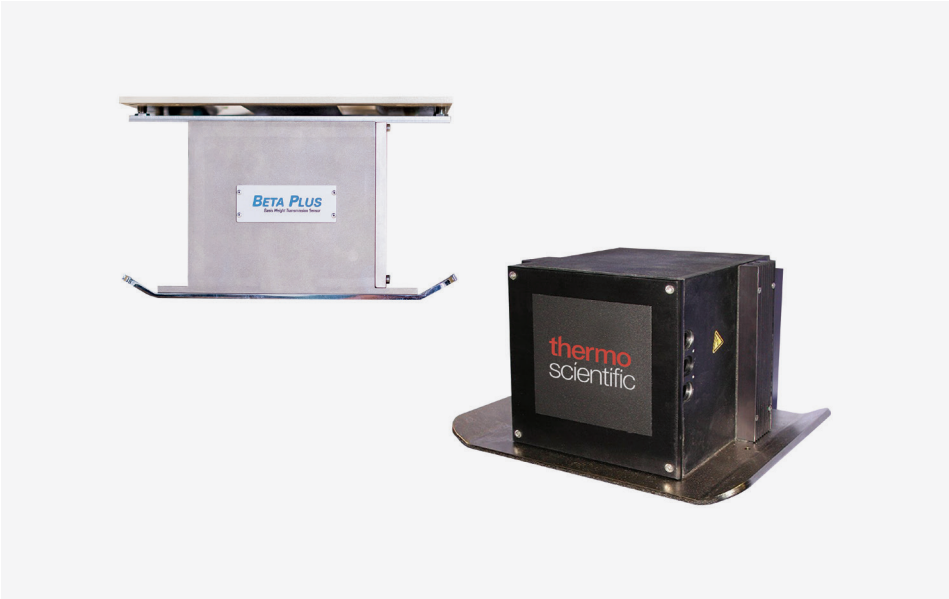
- Small measurement spot size and high sampling rate for unmatched streak resolution and analysis of coating edge defects
- Faster scan speeds for greater area coverage ensuring fewer defects go undetected
- Precise measurement and automated slot die control to ensure adherence to the most challenging product specifications
- Precise patch width dimensional analysis to avoid excess wastage of electrode material
- Cloud-based archival of data and identified defects for full traceability of product imperfections
- Cloud-based Digital IPM, instrument performance management, enables automatic 24/7 smart monitoring of instrument health, status, and secure archival of data with compliance-ready data integrity and security
- Automatic notification services for rapid service response time with instrument health diagnostics to improve first-time fix rate, resulting in reduced downtime and higher productivity

Purposeful innovation

Accurate sensor technology developed for batteries

LInspector measurement and control system provides the right technology for the right application.

For electrode coating lines both beta and x-ray sensor technologies are available for both positive electrode coating and negative electrode coating. Thermo Scientific™ Substrate Independent Calibration (SICAL) algorithm allows direct calibration of the coating layer, independent of the substrate, allowing for a more accurate coating weight measurement, whether the substrate is copper or aluminum. While beta and x-ray sensor technologies are available options for separator film thickness measurement, laser is the ideal sensor choice for calendering lines.



Greater coverage, speed, and resolution

Detect defects with confidence

Improve quality and save on costly wastage

Robust technology

Scanners and frames built for batteries

The Thermo Scientific™ INTEGRA™ O-Frame Scanner is part of an intelligent network and provides exceptional value with high-speed scanning for greater measurement coverage. The rugged exoskeleton design of the INTEGRA O-Frame scanner provides high stability and isolates mechanical and electrical components from the environment within its thick plate walls. It also uses Thomson™ rails and bearings, laser aligned to ensure precision head alignments and negligible run outs.

The Thermo Scientific™ INTEGRA™ C-Frame Scanner combines robust design and high acquisition speeds for best-in-class measurement performance in electrode calendering applications. Its single component aluminum construction is self-calibrating and provides high rigidity and temperature stability. The INTEGRA C-Frame Scanner has integrated precision guide rolls to ensure accurate measurement in real time. It conforms to clean room specifications and is available in single or double frame options for narrow and wider lines.

Exceptional value with high speed scanning for greater coverage

Make control decisions faster

LInspector measurement and control system offers a suite of advanced applications packages for lithium-ion battery.

Specific displays for battery manufacturing include:

- Stripe/patch/pattern statistics
- Roll report
- Stripe/patch/pattern edge zoom
- Heat map display

Combining process visibility, ease of interpretation and operational awareness

Support you can depend on

Thermo Scientific products are supported by our extensive network of qualified application engineers who will work closely with you to understand and evaluate your specific production parameters. Our experts will help you choose the right instruments for your application, then keep them performing to spec.

Product maintenance

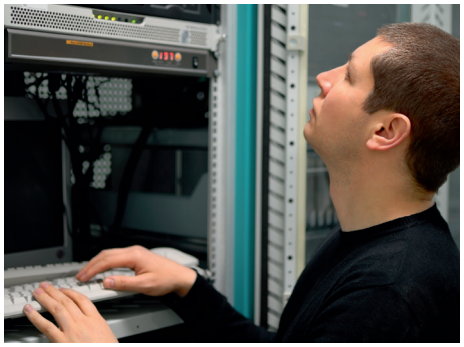
Our comprehensive service offering is based on corrective and preventative maintenance that reduces downtime and also helps you improve your process. We offer multiple levels of support agreements, with varying degrees of access and response, including:

- System commissioning
- System calibration
- Preventative maintenance
- On-site repair
- Depot repair

Some options feature complete cost predictability, with all travel, labor, spare parts, and consumables included.

Instrument Performance Management

Thermo Scientific™ Instrument Performance Management (IPM) Software helps to maintain production uptime and reduce the occurrence of unplanned maintenance. The cloud-based service platform actively monitors the health, status and performance of gauging systems to intelligently identify critical issues in near real-time. Notifications are automatically sent to our Technical Support Team for immediate troubleshooting and intervention. With advanced diagnostic capabilities, IPM Software enables you to conduct root cause analysis, and quickly restore production. It also allows easy access to historical data and insights on operating costs plus a return-on-investment of service contract costs, supporting our predictive service capabilities and providing an easy and convenient way of working.



Education and training

We offer multiple training options to help you increase productivity by optimizing the use of your instruments and expanding the skills of your operators. Our range of courses covers:

- Basic operation
- Calibration
- Routine maintenance
- Troubleshooting
- Certification

We will also work with you to develop a custom program that meets your specific training objectives, often incorporating your own operating procedures.

Professional services

Our certified engineers are available to review your process, perform benefit analysis and recommend improvements to help you meet your best-practice goals. We will develop an implementation plan that integrates all Thermo Scientific systems, as well as third-party components including:

- System layout and connectivity
- Software implementation, configuration and support
- Site modifications

You can rely on us to manage the entire installation and start-up if you choose, including serving as a liaison with licensing agencies where necessary.

Parts and upgrades

Our spare parts are designed specifically for your Thermo Scientific system, and we make it easy for you to secure high-quality, low-cost replacements by maintaining offices around the world that respond quickly to your phone or online requests. You can also extend the lifetime of your older instruments with our add-on system enhancement and retrofit packages, which adapt your instruments for new uses and eliminate the time and cost to retrain operators on new equipment.

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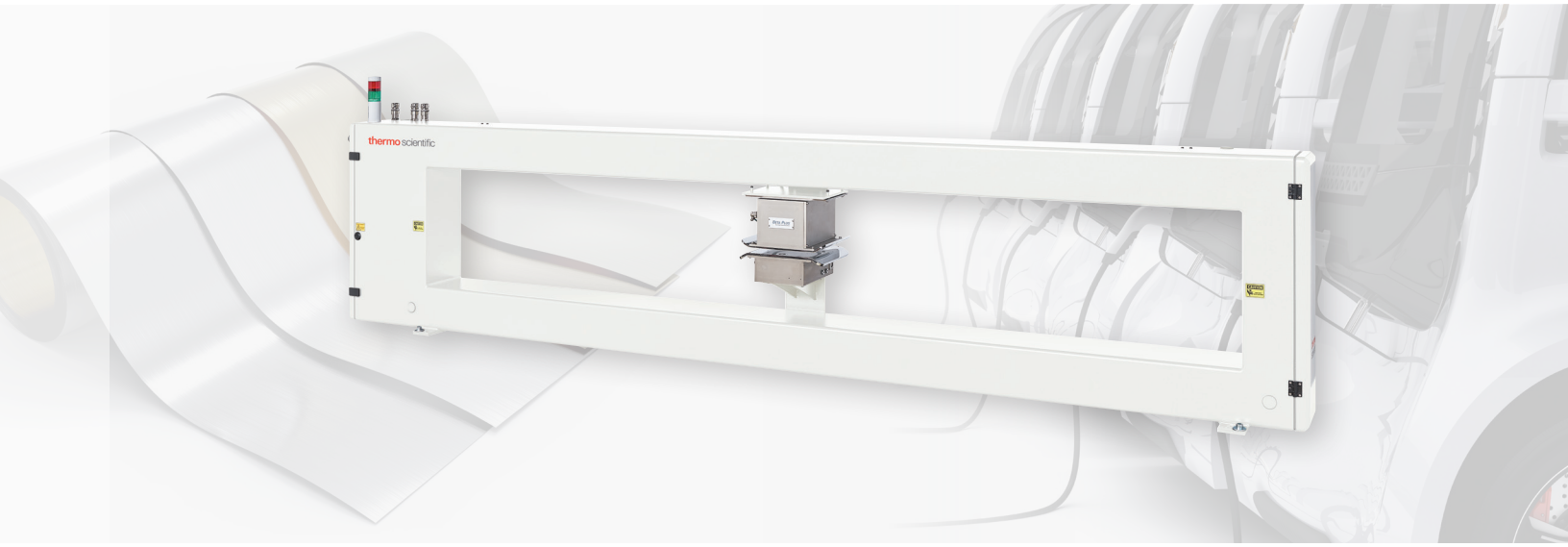

Learn more at **thermofisher.com/battery**
or email us at **sales.gauging@thermofisher.com**

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