Use Case



Intelligent Electric Vehicle Battery Manufacturing Solutions



ADLINK
LEADING EDGE COMPUTING

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ADLINK in the EV Battery Manufacture Industry

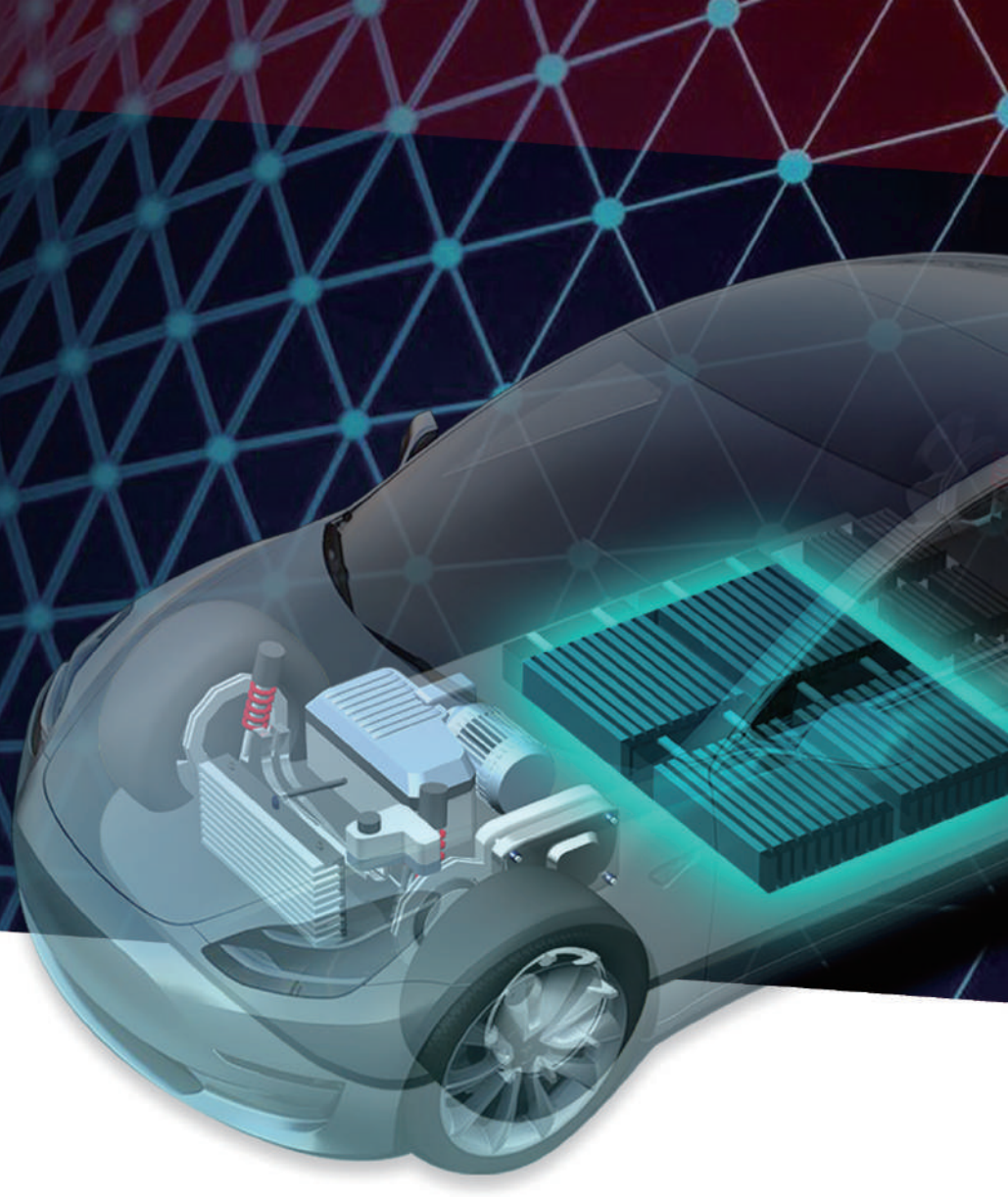
Optimizing EV Battery Production With AI

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ADLINK in the EV Battery Manufacture Industry

Optimized Battery Industrialization Manufacturing

According to the IEA, EV sales grew a staggering 35% from 2022 to 2023, and the demand for EV batteries was up 40% to over 750 GWh in the same period. Battery makers are scrambling to keep up with the demand. Evolving production processes are having a positive effect in helping to speed up the production line and increase capacity, but there remains an unfortunate side effect of the production process: defective products. In the current market climate, the quality of batteries becomes a significant differentiator when EV manufacturers select suppliers. Defective products also impact the bottom line because of the wasted resources. EV battery manufacturers need to find a way to increase their quality control regime and replace time-consuming and labor-intensive manual sampling inspections with automated inspections.



Our client specializes in developing algorithms for AI-powered visual inspection systems that identify defects and inaccuracies at speed and at scale. As a software-first developer, they wanted to avoid the headache of hardware incompatibilities, so they were looking for a reliable computer hardware partner who could provide a turnkey solution for the industrial computers, expansion cards, and GPU cards they needed. They wanted a partner who had done all the hard work of hardware verification ahead of time so that they could focus on the AI part of the picture while letting other experts handle the hardware. ADLINK's IPC, provided that solution with speed, expandability, and a selection of expansion cards to go with it.

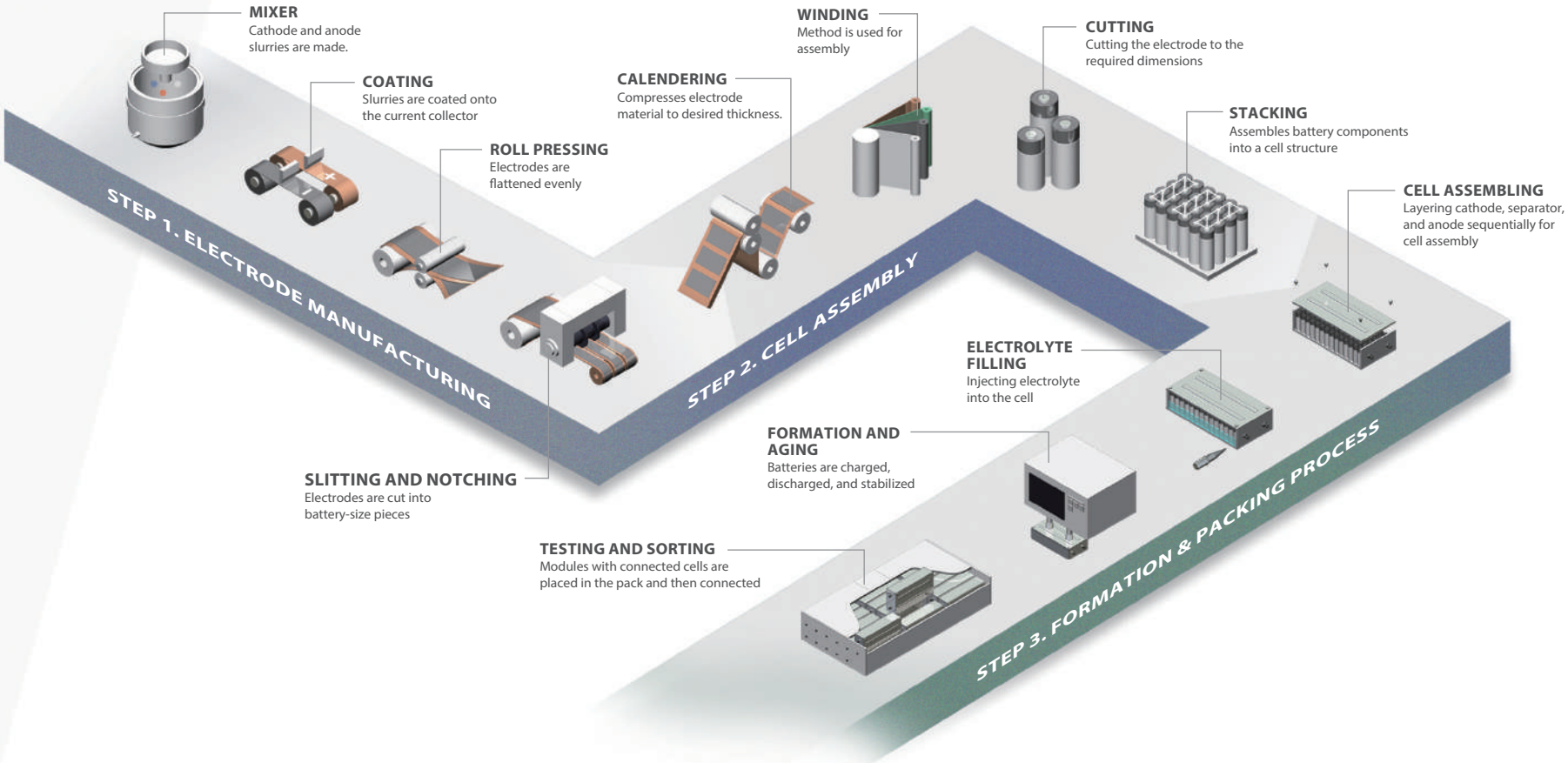
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ADLINK in the EV Battery Manufacture Industry

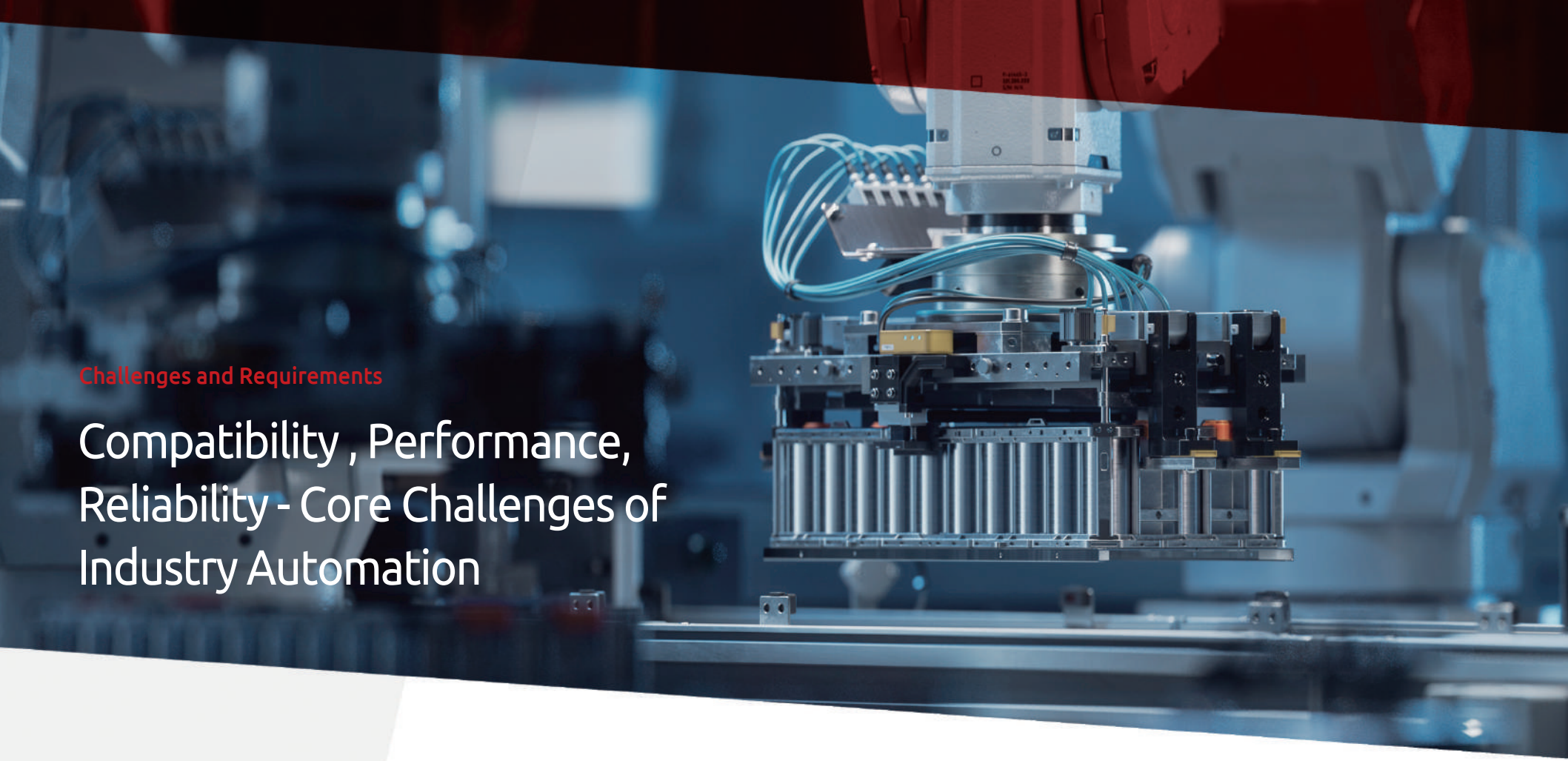
Boost Battery Production

Maximizing Battery Production in the Competitive Electric Vehicle Industry

Ensuring the quality and efficiency of batteries is crucial for the performance and safety of electric vehicles (EVs). With this in mind, most new energy EV battery manufacturers are actively advancing towards smart technologies, integrating motion control, visual inspection, and other technologies into the initial, middle, and final stages of the manufacturing process.



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Challenges and Requirements

Compatibility , Performance, Reliability - Core Challenges of Industry Automation

Our client was looking for hardware to support their AI-powered visual inspection systems for EV battery production lines. They needed an industrial computer with ample CPU and GPU power, expansion for video capture cards, and expandability to easily adapt the system to other use cases. In this case, they can use the system to check coatings, winding or stacking alignment, seal quality from ultrasonic and laser welding, and alignment of glued-on components.

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Challenges and Requirements

Ensure Compatibility when Scaling

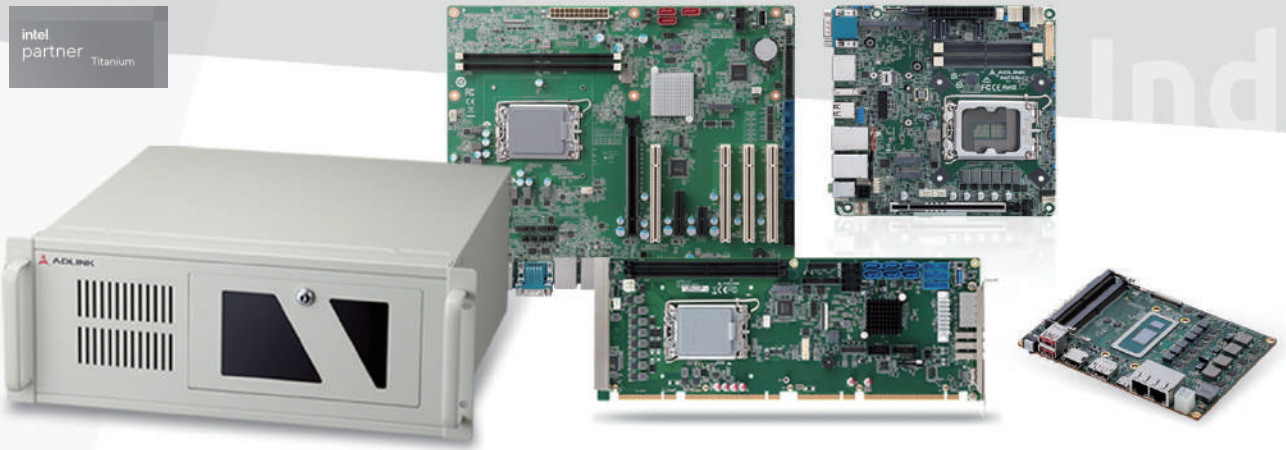
Predictable interoperability between the main system hardware, add-on system hardware, software, and any external devices connected to the system is the key to smooth integration. With a complex system of computer components, any bug or compatibility can easily add days to the development process.

One of the most important factors for predictable compatibility is the consistency of the constituent components. The fewer parts change, the less likely problems will occur.
The trouble is that EV battery manufacturing is a complex process. Within the three major stages of electrode production, cell assembly, and cell finishing, there are multiple steps involving equipment such as vacuum ovens, heat chambers, and laser welders.
Although visual inspection relies on video capture data, connecting with the production machines requires non-standard cards that might disrupt the compatibility paradigm within the machine. Ideally, the integrator would like a selection of cards to swap in and out without worrying about compatibility. This way, they can handle the scalability without sacrificing the compatibility.

Increase Performance and Retain Reliability

Speed is essential because an underpowered system creates more problems than it solves, introducing question marks to the analysis which should be helping to improve the system and not make it worse. Reliability with the flexibility to tweak the exact performance to match real-world requirements entails support for new tech and backward compatibility with older products.

Support for the latest CPUs is the first step. The latest generations provide a modern mix of multitasking finesse and high-power performance. AI, however, needs a little more. GPUs offer parallel computing power crucial for crunching massive data streams from cameras, sensors, and other inputs.
Memory is the other performance factor for AI applications. DDR5, the latest generation, is faster and offers greater capacity. That greater capacity is an integral part of the AI processing paradigm because the large incoming data stream of video and images needs to be stored and processed in memory. Speed and capacity are both crucial.



Industrial PC

ADLINK's IPC Family is equipped with multiple PCIe slots and supports DDR5 memory, ensuring seamless integration with ADLINK's pre-validated I/O cards for enhanced compatibility and performance. Featuring Intel's latest 14th Gen CPUs, these systems deliver cutting-edge processing power, offering significant advantages in speed, multitasking, and real-time data processing. This makes them especially suited for the rigorous demands of EV battery manufacturing, where precision, efficiency, and reliability are critical to maintaining high production standards and quality control.

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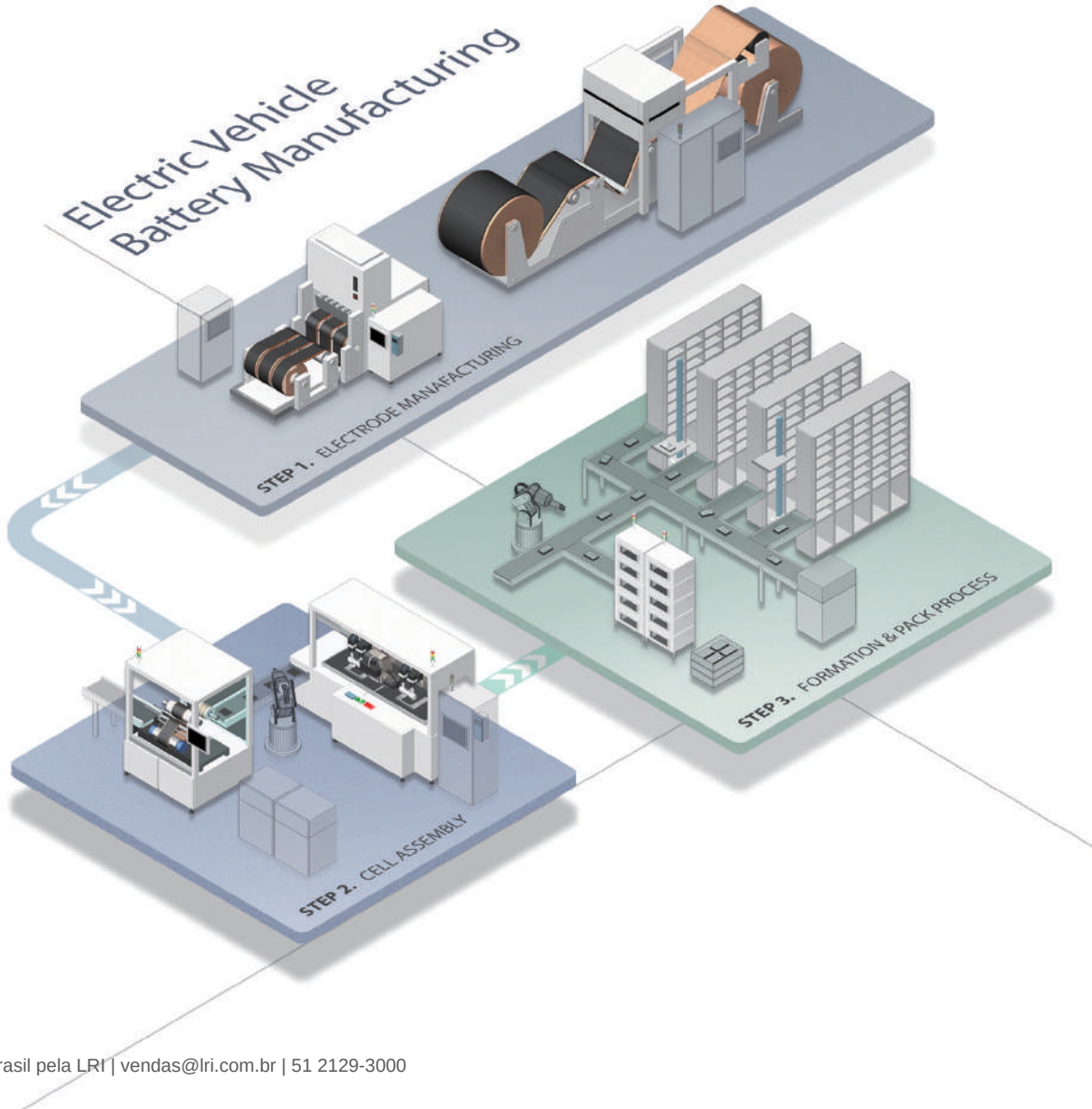
ADLINK Solution

Establishing a Digital Inspection Infrastructure with IPC and Image Capture Cards

In the complex realm of electric vehicle battery manufacturing, ADLINK Technology significantly enhances operational efficiency by integrating cutting-edge industrial PC solutions and professional image capture cards, ensuring meticulous digital inspections at every production stage. The process is methodically divided into initial, middle, and final stages—each dedicated to specific tasks such as electrode production, battery cell assembly, and activation testing, culminating in a modularization phase for final assembly.

Understanding the unique requirements of system integrators (SIs), ADLINK provides a comprehensive solution centered around the IMB-M47 motherboard.
This all-inclusive system includes a dedicated chassis and power supply unit (PSU), complemented by the PCIe-GIE74P image capture card and a GPU card.
This robust platform is designed to seamlessly integrate visual inspection technologies into battery production lines, offering a one-stop solution that simplifies system configuration and expedites the deployment process, thereby significantly enhancing production efficiency and improving quality control.

ADLINK's approach not only streamlines the integration process for system integrators but also sets itself apart from other industrial control companies by delivering a complete, ready-to-deploy solution instead of mere component-level offerings. This comprehensive strategy positions ADLINK as the ideal partner for system integrators aiming to deploy advanced visual inspection systems in battery manufacturing, ensuring adherence to high quality standards throughout the production cycle.



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ADLINK Solution

ADLINK's One-Stop Solution Elevates AI-Innovations in Electric Vehicle Battery Manufacturing

The ADLINK IMB-M47 industrial ATX motherboard is the ideal choice for AI-powered visual inspection applications that require many cameras. The motherboard provides ample processing power to keep up with general computing demands with support for the latest 14/13/12th Gen Intel® processors as a solid backbone to the rest of the system. Parallel processing prowess is the key to responsive real-time AI, so the IMB-M47 supports the latest PCIe Gen5 standard, enabling double the data rate compared to the previous generation, and giving an edge over devices designed for PCIe Gen4. Finally, the native expansion capacity allows the addition of two PCIe-GIE74P image capture cards to handle the large data volume of high-resolution line scan images.

Industrial PC



RK-620
Quiet Safety 4U Rackmount Chassis



IMB-M47/M47H
Pro Series Industrial ATX Motherboard



IMB-C47/C47H
Value Series Industrial ATX Motherboard



Nupro-E47
PICMG 1.3 Full-Size SBC

AI Vision



PCIe-GIE74P
4-ch GigE PoE+ Frame Grabbers



NVIDIA GPU
PCIe Graphic Card

Open eVision
Image Analytics Software

Motion Control



SuprtCAT
PC-based Controller Built-in Soft EtherCAT



ECAT-TRG4
EtherCAT SubDevice Modules

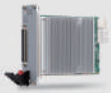
Test & Measurement



PCIe-9100
High-density PCIe-based DAQ



SDAQ-216/218
Up to 16-ch Standalone Edge DAQ



PXIe-9908
Source Measurement Unit (SMU)

Major features are shown below:

Latest Intel® Core™ Processors
Delivers ample power for day-to-day multitasking, and the extra power needed for more intensive processing.

PCIe x16 Gen5
ADLINK IPC's PCIe x16 interface supports PCIe Gen5, offering twice the bandwidth of Gen4, enabling faster data transfer for AI image processing.

PCIe x4 Gen4
Used for PCIe-GIE74P image capture cards, providing sufficient bandwidth for high-resolution line scan image transfer.

DDR5
The latest iteration of DDR doubles the speed of the previous generation, again providing a valuable speed boost for AI visual inspection applications that require the highest speeds possible for true real-time data acquisition and alerts.

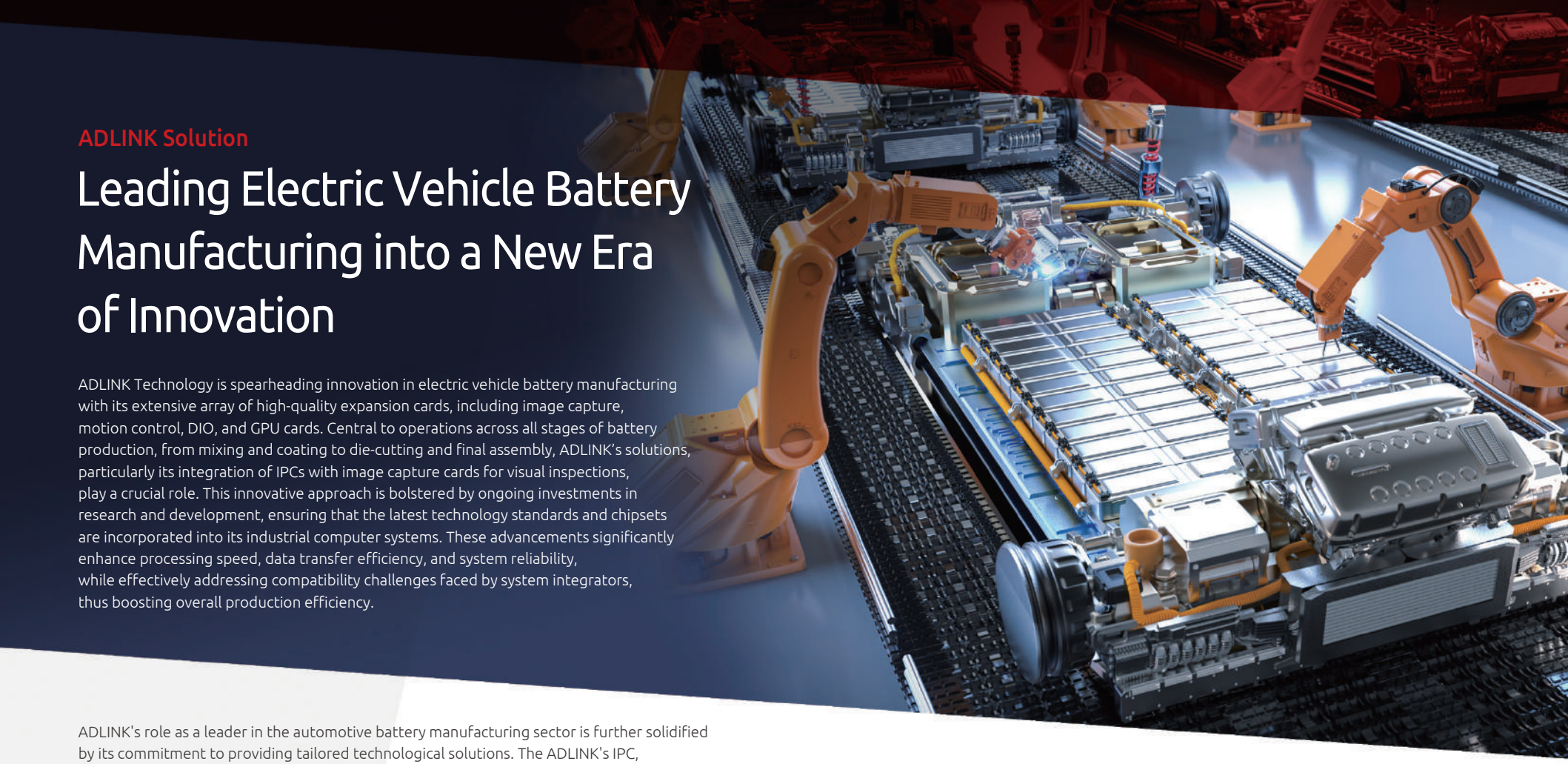
Full Compatibility with Pre-validated I/O Cards
Ensures seamless integration and optimized performance with ADLINK's pre-validated expansion vision, motion, DIO, and GPU cards, enhancing system reliability and expandability across diverse applications.

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ADLINK Solution

Leading Electric Vehicle Battery Manufacturing into a New Era of Innovation

ADLINK Technology is spearheading innovation in electric vehicle battery manufacturing with its extensive array of high-quality expansion cards, including image capture, motion control, DIO, and GPU cards. Central to operations across all stages of battery production, from mixing and coating to die-cutting and final assembly, ADLINK's solutions, particularly its integration of IPCs with image capture cards for visual inspections, play a crucial role. This innovative approach is bolstered by ongoing investments in research and development, ensuring that the latest technology standards and chipsets are incorporated into its industrial computer systems. These advancements significantly enhance processing speed, data transfer efficiency, and system reliability, while effectively addressing compatibility challenges faced by system integrators, thus boosting overall production efficiency.



ADLINK's role as a leader in the automotive battery manufacturing sector is further solidified by its commitment to providing tailored technological solutions. The ADLINK's IPC, optimized by an expert R&D team, exemplifies this commitment by combining the latest Intel processors, PCIe Gen5, PCIe Gen4, and DDR5 technologies.

This enables cutting-edge AI solutions with real-time tracking, data analytics, and automation capabilities essential for high-precision AI-powered visual inspections and other AI applications. For more insights into how ADLINK is driving innovation in battery manufacturing and to explore the capabilities of the ADLINK IMB-M47 motherboard, please contact ADLINK Technology for further information on our products and solutions.

Learn more about the **ADLINK EV Battery Manufacturing Solution** or contact **ADLINK** for more information about products and solutions.

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