



BATTERY ASSEMBLY SYSTEMS

- High quality machines made by PIA locations world-wide
- Project experience with all 3 primary battery types (cylindrical, prismatic, pouch)
- Global support with local production/service options in Asia, EU, NA

The market for new energy vehicles is developing rapidly and the requirements for battery systems are constantly increasing.





” The high flexibility of our modular production systems allows us to react to new customer requirements quickly.

Shilai Xie, Co-Chief Executive Officer (CO-CEO)
PIA Automation Holding GmbH

BATTERY

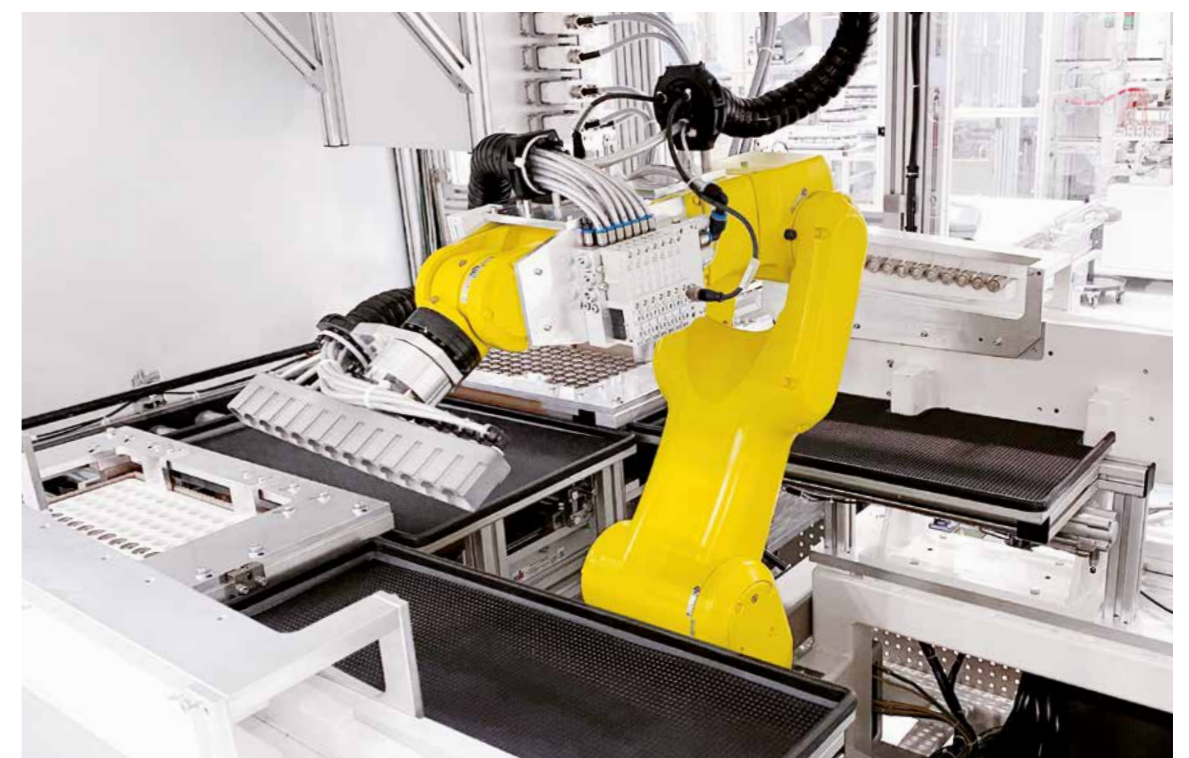
Nothing less than 100% quality is acceptable

The e-revolution in the automotive industry has far-reaching consequences for production: The high diversity of variants and quality requirements in the powertrain sector are now being continuously forced by the emerging drive concepts for hybrid and electric drives.

As a result of this pressure to innovate, adaptable concepts are becoming increasingly important, as these market requirements demand highly adaptable and process-reliable production systems. PIA Automation focuses on flexible assembly stations, high-precision measuring machines and testing machines with patented technology. PIA offers versatile and customized solutions for the production of battery modules and packs – from central contacting systems to covers for battery housing.

For every requirement the perfect technology

- System solutions for the production of lithium-ion battery cells (cylindrical, prismatic or pouch), battery modules and battery packs.
- Screw, welding, bonding or crimping processes are used for the connections.
- Depending on requirements, solutions for partially and fully automated production are available.
- Safety and fire protection concepts are developed in cooperation with the plant operator and adapted to individual requirements.
- Quality monitoring and traceability of incoming materials as well as end-of-line (EOL) testing of battery cells, modules and packs can be offered from a single source.



RANGE OF COMPETENCES

CELL / MODULE / PACK ASSEMBLY

- Cell to module assembly
- Module to pack assembly
- Cell to pack assembly
- EOL testing

FUEL CELL ASSEMBLY

- Stack assembly
- System assembly

COMPONENT ASSEMBLY

- Cell contact system
- Lid/Cap assembly
- BMS, Inverter, Booster

COMPONENT HANDLING

- Cell/Module repacking system
- Battery cell housing handling system (washing, handling, CCD inspection, packaging)

INTERNAL TRANSFER SYSTEM - PIAAMR

While rigid transfer systems were still common in the assembly process until recently, customers are increasingly demanding modular and adaptable systems. Autonomous mobile robots (AMR) offer the next evolutionary step here: flexible layout, free orientation and an almost unlimited number of styles are the greatest assets here.

- Load suspension device: workpiece-specific, height adjustable, swiveling $\pm 180^\circ$
- Payload: up to 1.000 kg / 2.204 lb
- Innovative charging concept - up to 15 years or 17.000 charging cycles
- Sustainable use



RANGE OF ASSEMBLY

FAST ASSEMBLY



- **Cell handling**
20+ parts per minute prismatic/pouch
30+ per minute for 46 series large cylindrical cells
60+ parts per minute cylindrical
- **Lid & Cap assembly**
40+ parts per minute for prismatic cell cap
180+ parts per minute for cylindrical cell lid
- **Module assembly**
15+ parts per minute for prismatic cell

HEAVY DUTY ASSEMBLY



- **Inverter & Booster assembly**
20 - 30 kg | 44 - 66 lb
- **Module**
30 - 200 kg | 66 - 440 lb
- **Pack**
200 - 1.500 kg | 440 - 3.307 lb
- **Autonomous Mobile Robot (AMR)**
Payload: up to 1.000 kg / 2.204 lb

CELL CONTACT SYSTEM (CCS) ASSEMBLY

Being a crucial element within the battery module, the cell contact system serves to interconnect individual cells in both parallel and series configurations. PIA offers a highly automated, flexible, and customized solution for assembling the cell contact system. This solution can be tailored as an independent manufacturing line or as a pre-assembly process to seamlessly integrate into the final battery module assembly.

Leveraging PIA's unique expertise in manufacturing production lines of electronic components and battery modules guarantees a highly efficient production of the cell contact system with exceptional quality.

PROCESSES

- Feeding individual component
- Busbar pre-assembly
- Hot riveting
- FPC pre-assembly
- Laser welding
- EOL testing
- Laser marking
- Packaging

LID & CAP ASSEMBLY

Functioning as a vital safety component for battery cells, battery lids and caps play a crucial role in isolating the active battery materials from other auxiliary elements, thereby guaranteeing the consistent performance of the battery. Drawing upon its extensive history in assembling small electronic components, PIA provides customers with a rapid and precise assembly line tailored for battery lids and caps.

PIA's extensive expertise in laser welding, dispensing, and vision inspection further solidifies the streamlined production process, ensuring the creation of lids and caps with remarkable efficiency and uncompromising quality.

PROCESSES

- Feeding individual component
- Vision-aided positioning
- Dispensing
- Laser welding
- Sealing
- Vision inspection
- EOL testing
- Packaging

CELL MANUFACTURING PROCESS

For the production of battery cells, PIA offers years of experience in process-safe and reliable assembly of small parts in the high-cycle range. Cells can be produced in cylindrical, prismatic or pouch form. The scope of services includes the assembly of all components: Electrode winding or stack, housing, cover, seal, insulation and safety valve. The assembly is completed by qualified EOL testing.

PROCESSES

- Feeding
- Laser welding
- Packaging
- EOL testing
- Stacking

VARIOUS CELLS



CYLINDRIC CELLS



POUCH CELLS



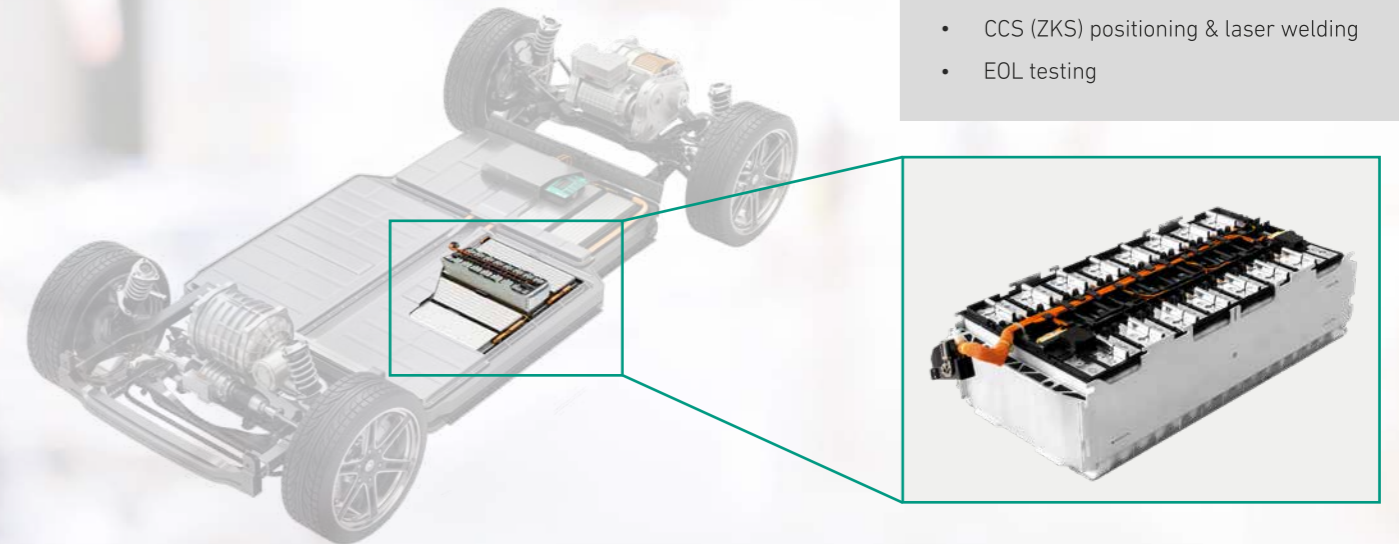
PRISMATIC CELLS

MODULE MANUFACTURING PROCESS

In the field of battery modules, PIA Automation is the ideal partner for the key processes of laser welding, cleaning, testing, stacking and handling of medium-weight parts. Customers also benefit from PIA's know-how in software, traceability and logistics, based on many years of experience in the automotive industry.

PROCESSES

- Cell loading & feeding
- BOL testing
- Plasma treatment
- Cell cutting & bending (Pouch)
- Dispensing, bonding and taping
- Cell stacking
- CCS (ZKS) positioning & laser welding
- EOL testing

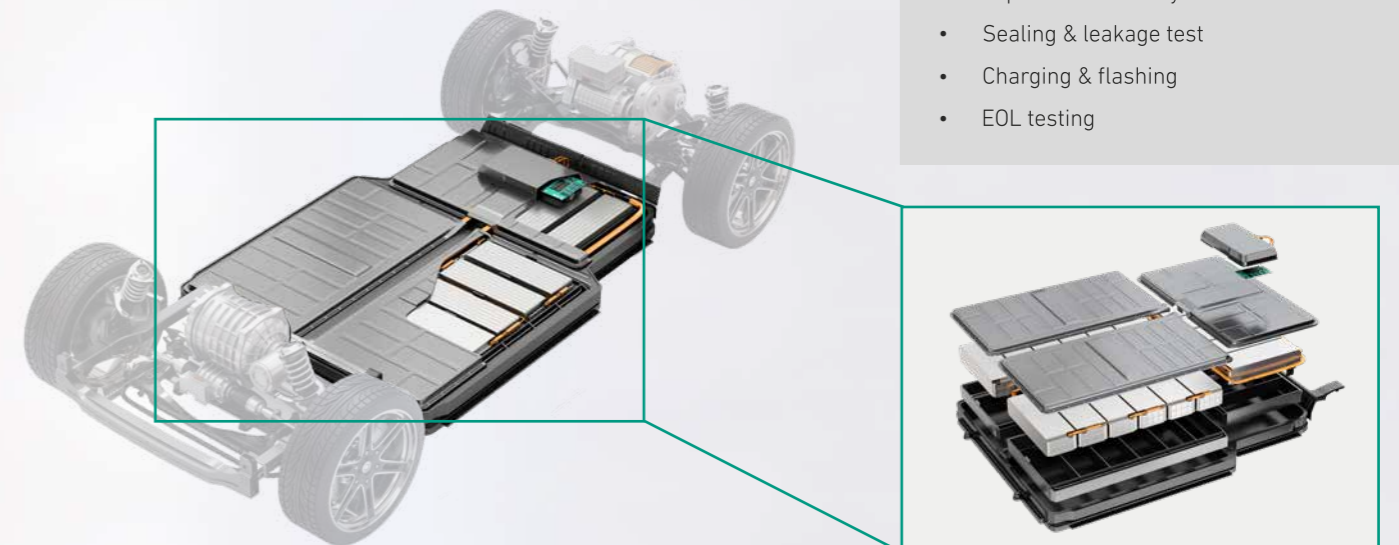


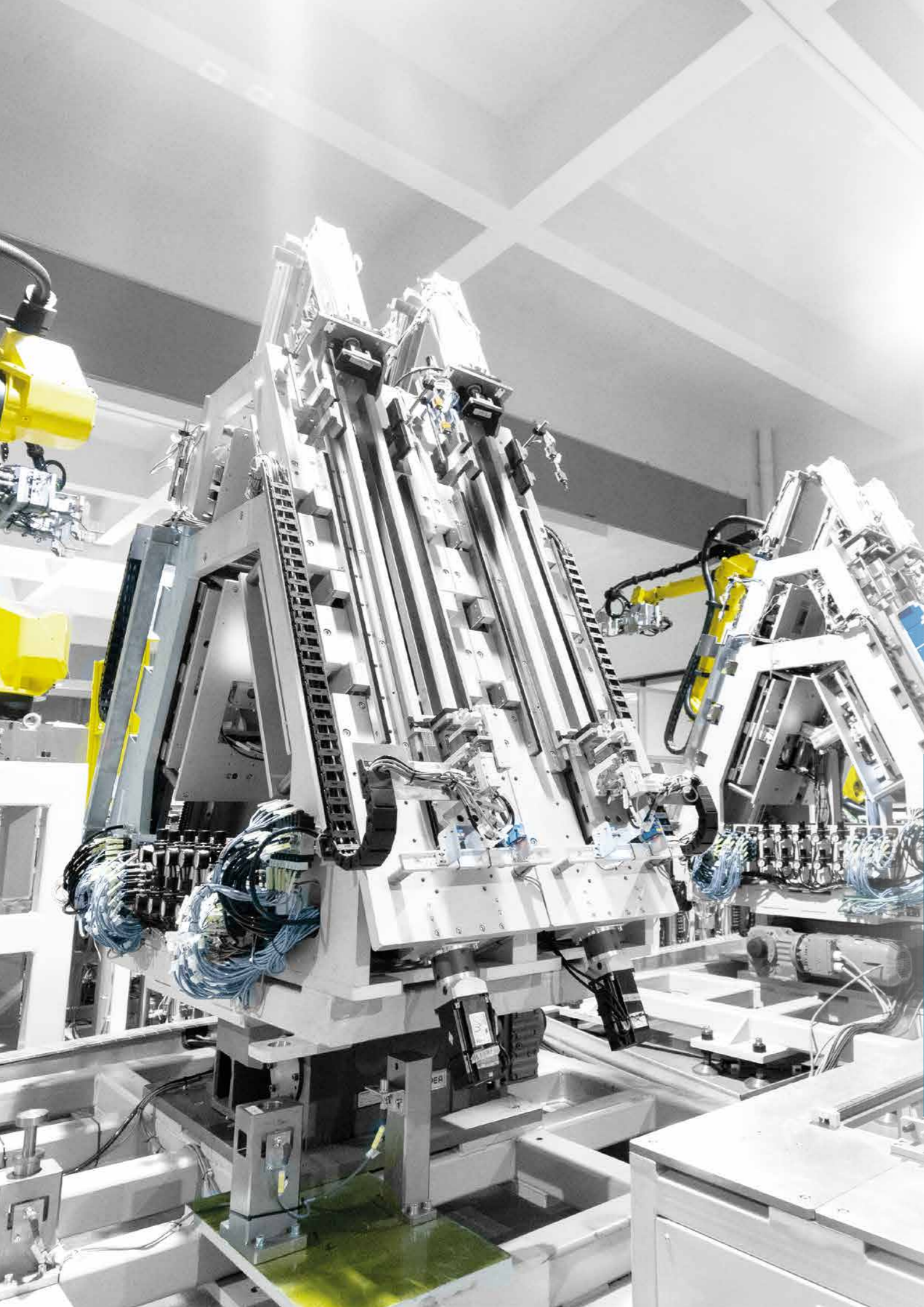
PACK MANUFACTURING PROCESS

Besides conventional automation systems, we can also offer flexible and scalable solutions in battery pack production using our AMR (Autonomous Mobile Robot). Due to the high flexibility within the PIA Group, we can react to market needs and implement special requirements.

PROCESSES

- Pack housing loading
- Module insertion
- BMS pre-assembly
- Electrical & thermal component integration
- Top cover assembly
- Sealing & leakage test
- Charging & flashing
- EOL testing





E-MOBILITY AS A MEGATREND IN AUTOMATIZATION

With the rapid rise of e-mobility, the automotive industry is facing increasingly demanding tasks.

As a leading company in the field of automation technology, we offer customized production solutions to our premium automotive customers. In recent years, the demand from OEMs and Tier-1s for e-drive trains and battery systems has increased substantially. The topic of e-mobility is a big game changer, both for our customers and as well for our company. It appears that the classic powertrain will be replaced by the alternative electric powertrain in the future. Here at PIA, we recognized the trend towards e-mobility early on, adapted processes and comprehensively analyzed our customers' requirements. Together with OEM and Tier 1 customers, new assembly processes and test procedures are now being developed. We consult with our clients early, when the planning phase starts, as well as contributing our expertise to the formulation of requirements.

Among other things, we also support our customers in setting up battery production globally. E-mobility would not be conceivable without reliable, high-performance battery systems and, although we face new challenges for manufacturing, PIA has established itself to meet the needs of its customers. Currently, it is possible to process three types of battery cells into individual modules. These modules consist of either cylindrical cells, prismatic cells or pouch cells that subsequently form battery packs. The interaction of the battery cell, module and packaging system must be perfectly matched to ensure a high-quality end product. Thanks to years of experience with highly complex assembly processes, we are well positioned for the future in e-drives and battery systems.



” The quality of the product is always our first priority - the battery must be 100 % in order and work perfectly. Because of the high voltage battery parts, employee safety is also essential during the processes of battery production. Each of our employees are specially trained for these highly complex processes.

Markus Wagner, Senior Account Manager
PIA Automation Austria

PIA INDUSTRIAL APP SUITE



The digital package of the future

The PIA Industrial App Suite (piaIAS) is a modular software package and contains smart apps to meet the challenges of assembly line operation and optimization. In developing the apps, the knowledge of custom machine builders - especially the expertise of PIA Automation - and customers from a wide range of industries were combined to create a digital solution portfolio that is perfectly aligned with customer requirements. Assembly and test systems can be analyzed worldwide, their weak points localized and their productivity optimized. It doesn't matter whether it is a single station or a complex interlinked assembly line locally on site or remotely at another location.

PIA's smart tools address different user groups with features providing information for line workers, evaluations for shift managers and the maintenance team, or reports for management. All apps share the following advantages: (1) Increasing the degree of digitalization of production, (2) future-proofing thanks to modular and expandable design, and (3) reduction of travel costs through location - and device-independent access.

ADVANCED

DATA ANALYSIS

ET piaOEEtracker
to increase the
Availability

Target group: Production manager

Key-Features:
Classification of plant shutdowns

Benefits:

- Increase of availability at line and station level
- Increase in output through the prevention of shutdowns
- Efficient use of existing plant capacity

AN piaAnalyze
to improve the
Quality

Target group: Quality manager

Key-Features:
Analysis of measurement and process data

Benefits:

- Increase in the quality of production
- Reduction of costs through rejects prevention or increase of the IO rate
- Prevention of rework and thus increase the plant profitability

OP piaOptimum
to optimize the
Efficiency

Target groups: Production manager
Optimization team

Key-Features:
Analysis of cycle times and partial cycles

Benefits:

- Increase in efficiency, output and thus plant profitability
- Cost reduction due to earlier start of production (short ramp-up phase)
- Support for optimization measures during operation

BASIC

DATA ACQUISITION

VB Visibility Box
to increase the
Digitization | Transparency | Insights

Target group: Production Manager | Operators

Key-Features:

- Dashboard for production data
- Calculation and visualization of the OEE key figure
- Visualization and localization of assembly line bottlenecks

Benefits:

- Increase of availability at line and station level
- Increase in output through the prevention of shutdowns
- Efficient use of existing plant capacity

CUSTOMER SERVICE

Our Service ensures maximum availability

With our configurable Customer Service Packages, we offer professional solutions to optimize the uptime of your machine. That offers a wide range of customer services such as reactive, preventive, adaptive and predictive services.



We make high-quality products available to everyone – sustainable and worldwide.



creating efficiency.
in global battery assembly systems.

Austria. Canada. China. Croatia. Germany.
Mexico. USA.



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