

POWERTRAIN

# GIVING MOMENTUM TO THE FUTURE

The automotive powertrain is undergoing major changes. The demands on the system in terms of performance, consumption, exhaust emissions and durability have increased enormously. PIA offers comprehensive production solutions for combustion, hybrid and electric drive systems. The modular production units include all machines and equipment required for the assembly and testing of powertrain assemblies. In this area, PIA can draw on system expertise that has grown over decades.

Numerous technological developments within the powertrain are based on automated processes that were conceived and continuously refined at PIA. Our most important motivation is to combine innovative production technologies with technically advanced solutions and to open up new ways for our customers to achieve reliable productivity.

With the PIA Industrial App Suite – a portfolio of 14.0 solutions – we support our customers in achieving their business objectives (e.g. improved OEE, increased production quality, more transparent production planning) in a sustainable way.

### ASSEMBLY AND TESTING SYSTEMS FOR POWERTRAIN COMPONENTS

- Engines and auxiliary units (e.g. turbochargers, camshafts, torsional dampers, dual mass flywheel, double clutch)
- Dual clutch transmission
- Transfer case, front and rear axle transmission
- Differential modules
- Steering systems



ENGINE AND AUXILIARY UNITS



DUAL CLUTCH TRANSMISSION



FRONT DRIVE UNITS



REAR DRIVE UNITS



STEERING SYSTEMS



DIFFERENTIAL MODULES



## PIA BRANCHES PRODUCTION, MEASUREMENT AND TESTING SYSTEMS FROM A GLOBAL AUTOMATION SPECIALIST



**Visibility Box**

**piaOEEtracker**

**piaAnalyze**

**piaOptimum**

**piaLineController**

**piaDynamics**

**PIA INDUSTRIAL APP SUITE**

The high-quality I4.0 solutions of the PIA Industrial App Suite provide extensive capabilities to meet the challenges of assembly line operation and optimization. With the smart applications our aim is to support our customers in achieving their business goals in a sustainable and proactive way. As with other goals we at PIA understand improvement of the OEE, the increase of the production quality or an even more flexible and more transparent production planning is important.

WE AUTOMATE YOUR WORLD

[www.piagroup.com](http://www.piagroup.com)

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DRIVE FOR THE FUTURE

# E-MOBILITY AND POWERTRAIN

PRODUCTION, MEASURING AND TESTING SYSTEMS FROM ONE SOURCE.

WE AUTOMATE YOUR WORLD





## E-MOBILITY

# WE AUTOMATE YOUR E-WORLD

The e-revolution in automotive engineering has had drastic consequences for production. For example, the variety of variants and increasing quality requirements within the powertrain area are constantly being supplemented by the newly emerging concepts for hybrid and electric drives. As a result of this pressure to innovate, adaptable and process-reliable production systems are gaining importance.

For the production of e-mobility components, PIA has developed the concept of partially automated and flexibly linked assembly cells. These result in an agile and future-proof system, which, due to product changes and type diversity, prepares the integration of further units and allows for a variable deployment of employees. The use of self-developed autonomous mobile robots (AMR) completes PIA's portfolio.

Power units and energy sources are an essential core element of e-mobility. For the production of battery modules and packages, PIA offers customized solutions both for mechanical and electrical assembly, as well as for fast cycle times and large components.

### ASSEMBLY AND TESTING SYSTEMS FOR E-MOBILITY COMPONENTS

- Hybrid Modules
- E-drives and E-axes
- Rotors and Stators
- Starter Generators
- Battery Systems (Cylindrical, Prismatic, Pouch): Modules and Packs
- Cell connectors, Tempering systems
- Inverter, Booster, BMS



HYBRID MODULES



E-DRIVES



ROTORS, STATORS



BATTERY SYSTEMS



INVERTER



STARTER GENERATORS



## POWERTRAIN

### COLLAR NUT BOLTING

The collar nut bolting station is used for mounting the drive pinion bearing in transfer cases. The tightening criteria can be an end screw torque or a defined friction torque of the pinion bearing.

### TORSIONAL BACKLASH TEST

The dynamic torsional backlash measurement is used to check gear pairs. The backlash of the pairings and the imbalance of the gear set are determined and any damage to teeth is detected.

### GEAR SET SETTING STATION

This adjusting station is used to determine the shims of axle-distribution gearboxes with high precision - matched to the design of the gearbox - in order to achieve the correct circumferential backlash at the end of assembly.

### PRECISION MEASURING AND TESTING SYSTEMS

PIA's measurement and testing technology expertise guarantees perfect products and reliable quality assurance. All relevant measurements for coordination processes and intermediate tests (mechanical, electrical) of assemblies are carried out.

### LASER WELDING

Welded joints make it possible to significantly reduce both size and weight in the design of components. An ultrasonic inspection system enables automated inline seam inspection after welding.

### END-OF-LINE (EOL) TESTER

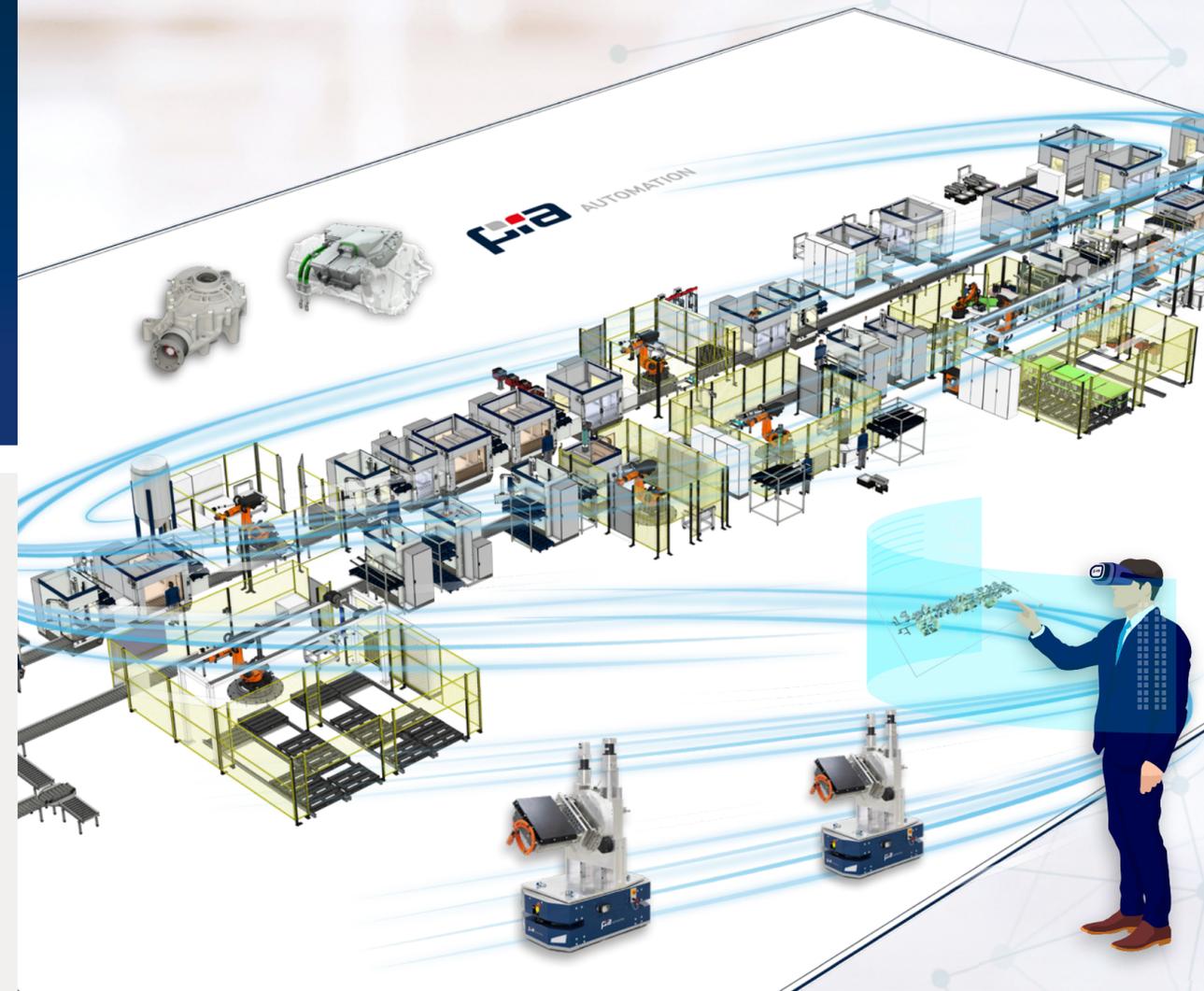
PIA's portfolio of test systems for testing complete systems ranges from complete EOL test fields (e.g. noise testing of gears and drive systems) to inline testers integrated in the assembly process. The range also covers the manufacturing of audit test benches.

FLEXIBLE | PROCESS RELIABILITY | PRECISE | DIGITAL

# POWERTRAIN INSPIRED ASSEMBLY

Engines with the most varied designs, the most diverse types of transmissions and components are high-end components and demand premium production solutions. As a one-stop solution provider, PIA supplies all the machines and processes needed to assemble and test components for conventional powertrain, electric and hybrid drive systems.

**ALL from one source!**



### REFERENCES



Both vehicle manufacturers and leading automotive suppliers have relied on PIA's automation expertise for many years.

AAM  
BMW  
BorgWarner

Continental  
DAF  
Daimler

Delphi  
Dräxlmaier  
GKN

Linamar  
Magna  
Preh

Valeo Siemens  
VW  
ZF



## E-MOBILITY

### E-MOBILITY PROCESSES

PIA is specialized in the production of assembly systems for electric and hybrid drives and has acquired the corresponding process know-how. Assembly systems for transmissions and electric machines, assembly of rotor and stator, magnetization of the rotor, inductive heating, flashing of the control unit, winding (with partners). PIA systems are scalable for all customer needs (e.g. start with few stations, expansion with AMRs or transfer system and duplicated stations).

### BATTERY MOUNTING SYSTEMS

The heart of the e-drive cannot be reliable enough. PIA has production and testing solutions for long-life battery modules and packages. Laser welding systems for connecting the battery cells, final assembly systems for modules, assembly systems for battery connectors (ZKS), production systems for connectors (HV), inspection and test stands for battery modules, etc.

### TRANSFER SYSTEMS

Transfer systems must be flexible for the products of tomorrow. Depending on customer requirements, PIA's portfolio ranges from rigidly linked systems and manual assembly trolleys to the in-house development of autonomously driven transport systems (AGV/AMR).

### DIGITALIZATION AND NETWORKING OF PRODUCTION

- PIA's I4.0 solutions provide comprehensive functionality for production, maintenance and quality managers to meet the challenges of plant operation and optimization. Making big data smart!
- PIA uses Virtual Reality as a tool in engineering as well as at the interface to the customer. Plant review in the planning phase (e.g. ergonomics, logistics, assembly, walkways) offline training etc