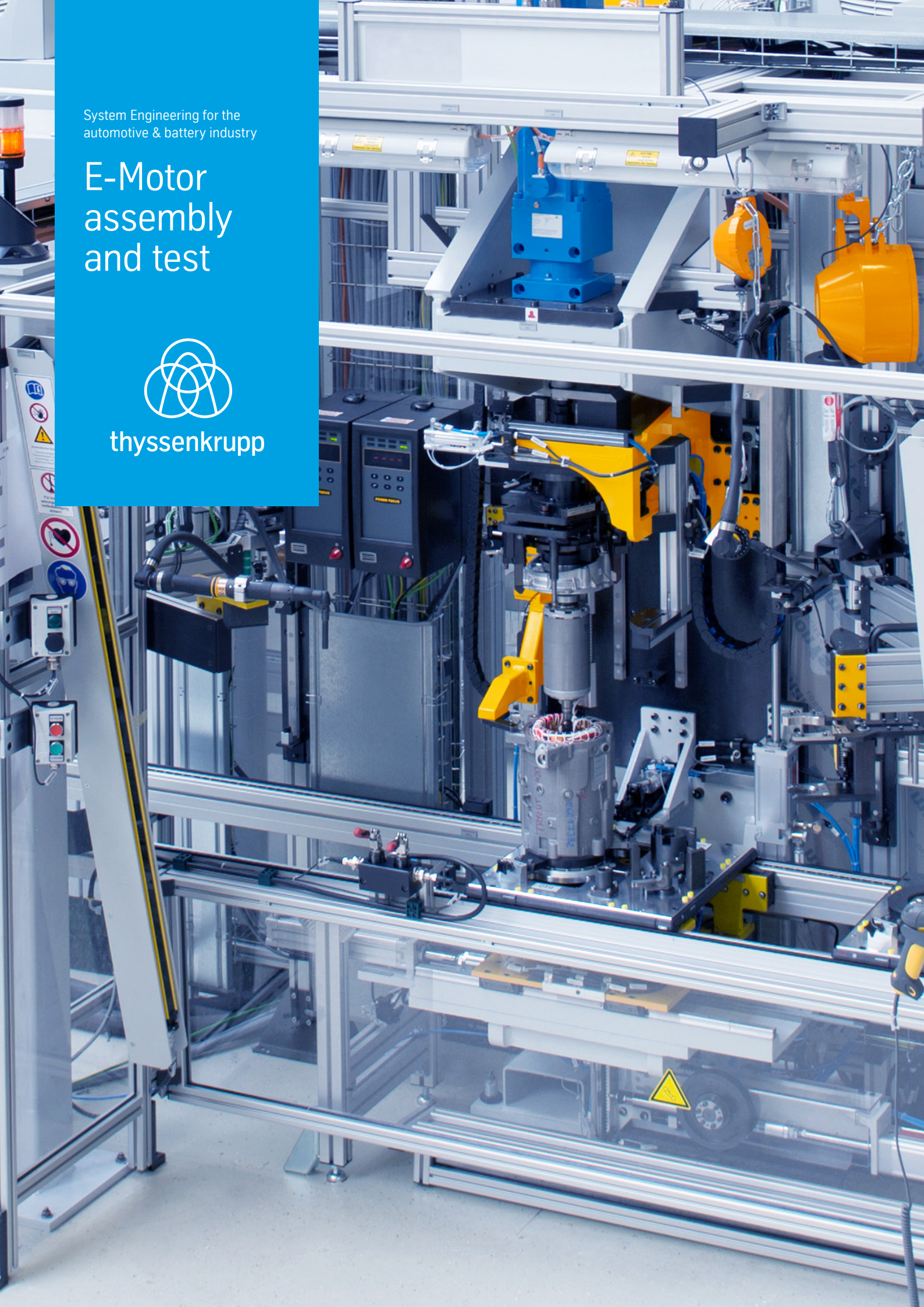


System Engineering for the
automotive & battery industry

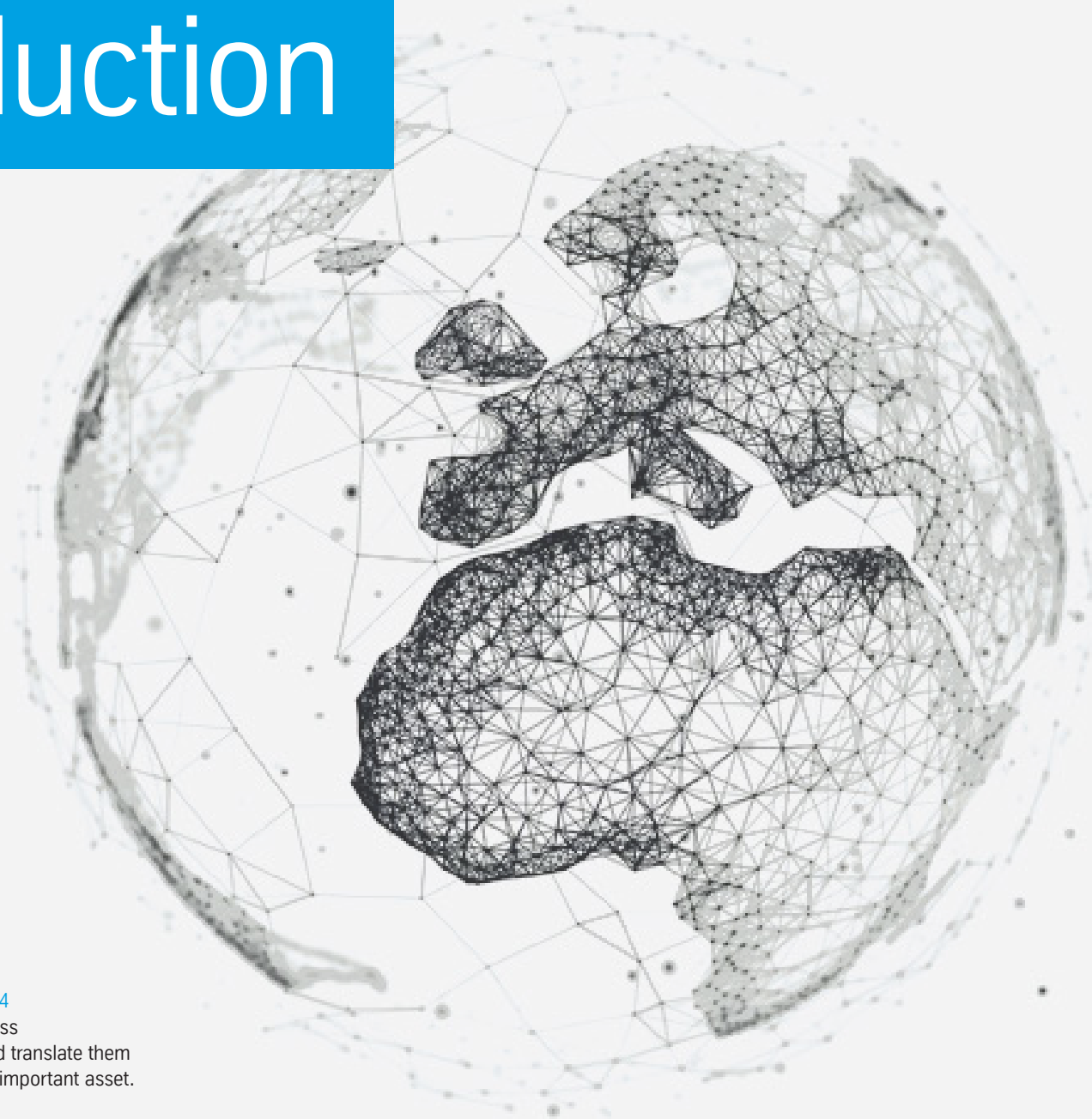
E-Motor assembly and test



thyssenkrupp



Solutions for industrial series production



Winner of the thyssenkrupp Innovation Contest 2014

The ideas of our employees are crucial to the success of thyssenkrupp. The people who develop ideas and translate them into successful products and services are the most important asset.

thyssenkrupp System Engineering is an operating business unit of the Automotive Technology segment of the thyssenkrupp AG, a system partner for all important components of the process chains car body and powertrain in automotive industry. The product range also includes automation solutions for electrical storage and drive systems as well as solutions for innovative lightweight designs.

The company is a strong and reliable partner to its customers, optimizing their value added chain and strengthening their efficiency.

Knowledge and expertise designed to shape the market of the future

Low-emission electric propulsion systems will characterize and shape the mobility of the future. Currently, electric powertrains and renewable energies are expanding their market shares.

System Engineering is bringing its extensive experience from production lines of the automotive industry to the manufacturing process of modern energy storage and propulsion systems.

Our product range for the electric mobility:

- Li-ion cell assembly lines
- Cell formation and finishing
- Battery module and pack assembly lines
- Electric motor assembly lines
- End of Line test benches
- Service and support worldwide

Our comprehensive range of services includes the technical consulting for our customers in the development of design-to-assembly components and plant/factory planning. Our main scope of supply is design, manufacturing and commissioning of turnkey assembly lines from one source.

Our product spectrum

Stator assembly

- Assembly of coils
- Impregnation
- Assembly of contact ring

Rotor assembly

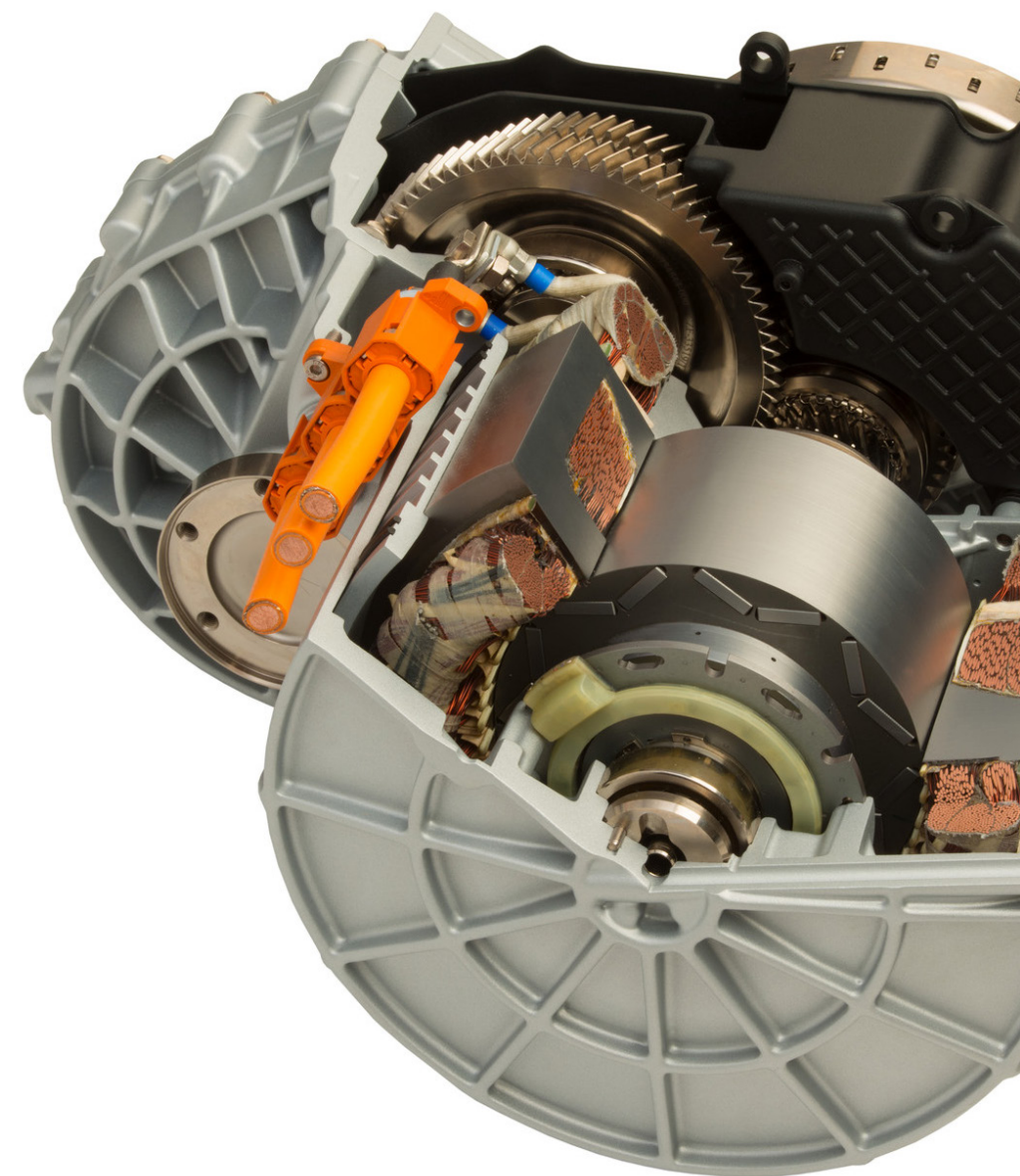
- Assembly of magnets
- Assembly of laminations with shaft
- Balancing and magnetizing

Final assembly

- Pre-assembly of bearings
- Adjustment of components
- Final assembly and finish

End of line test

- Isolation test
- Leak test
- Functional test



Assembly line for high speed traction motor

Balancing and magnetizing of rotor



- Balancing of rotor shaft
- Magnetizing and pressing of bearing
- 100% automatic operation due to ergonomics

Rotor assembly

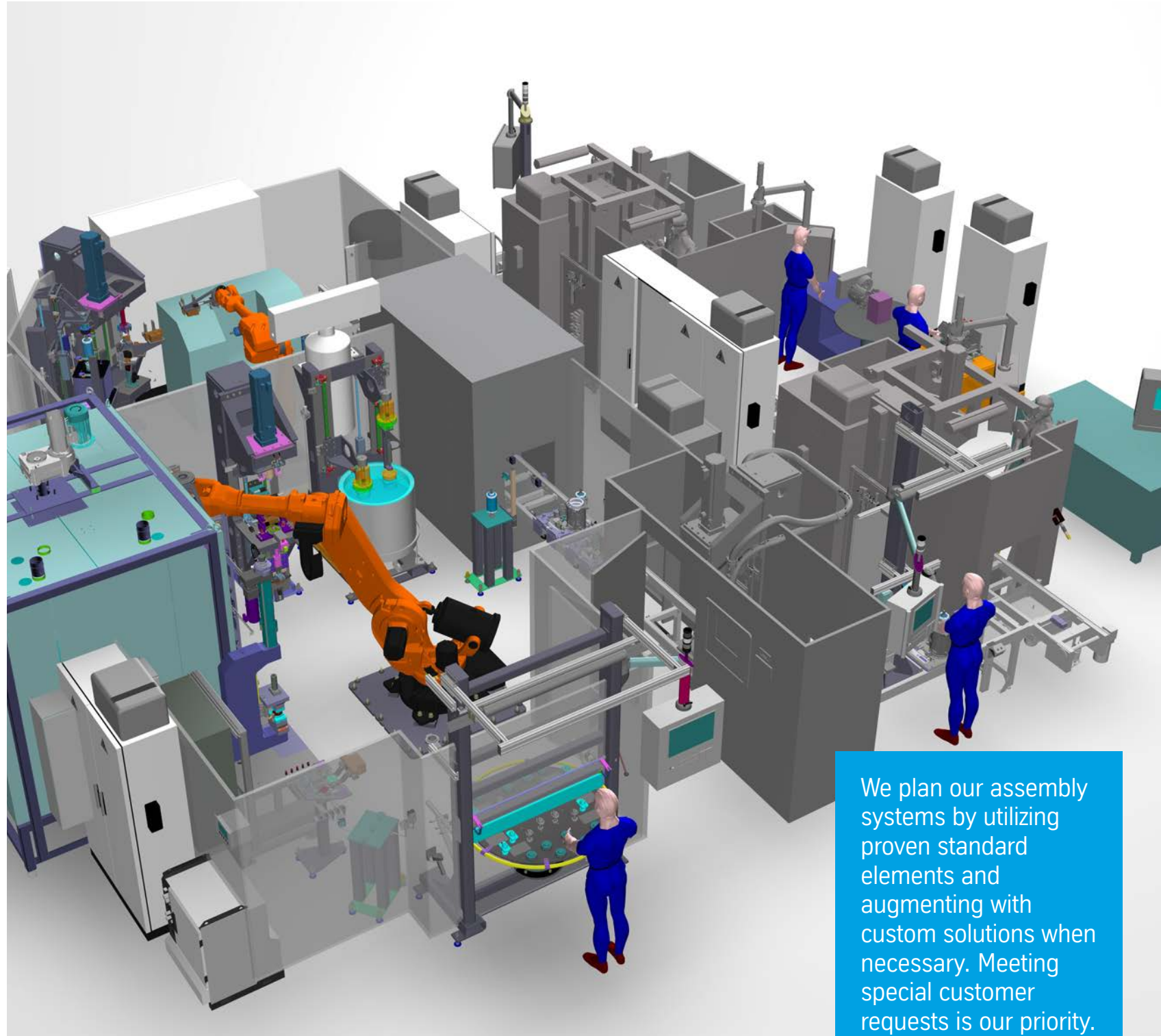


- Shrink fit of lamination with shaft
- Heating oven and cryo-bath for parts
- 100% automatic operation due to safety

Part insertion

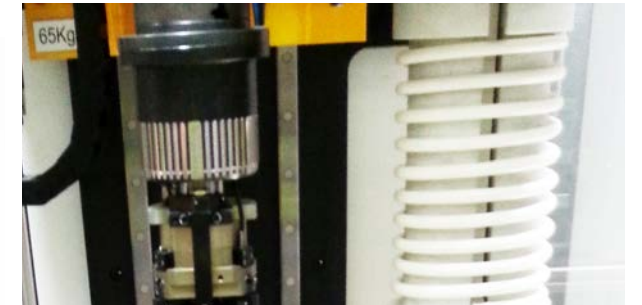


- Cost optimized robot pick solution
- Manual operation of turntable
- Cycle time independent by part buffering



We plan our assembly systems by utilizing proven standard elements and augmenting with custom solutions when necessary. Meeting special customer requests is our priority.

Stator assembly



- Inductive heating of stator housing
- Automatic picking and insertion of coil into housing
- Subsequent cooling tunnel for acclimation of parts

Final assembly of electric motor



- Combined station with manual and automatic operations
- Precise insertion of magnetized rotor into stator
- Automatic pressing of bearing, manual fastening

Assembly of transmission



- Semi-automatic work station
- Assembly aids for assisted operation
- Acquiring and saving of all fastening torques

Testing solutions for electric mobility

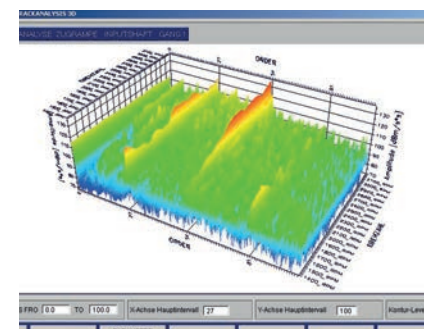
“We are developing test systems for electric drive trains based on 30 years of tried and tested experience in combustion engine and transmission test.”

Ingo Steinkrüger,
thyssenkrupp System Engineering

Test benches for electric powertrain

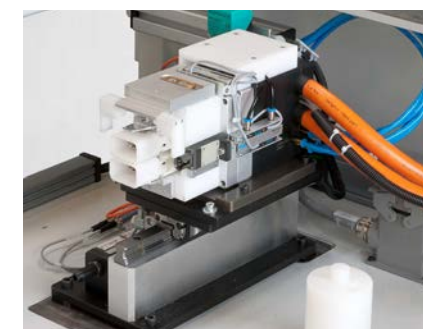
We deliver End of Line test benches for pilot and serial productions not only for individual electric motors but also for gearbox integrated traction motors in hybrid applications with combustion engines.

Testing software applicable



- Load test, clutch test
- NVH examination of transmission
- Electric tests for electric motor
- CAN bus/rest bus simulation

Mechanical elements



- Development of electrical connections (References: up to 300A/500V)
- Plugs for manual or automatic operations

Expertise



- More than 300 test benches already delivered for engines and transmissions
- Volume from R&D to serial production
- Sizes from motorcycle to trucks

Testing solutions for electric motors:

- Individual electric motors
- Gearbox integrated electric motors with transmission
- Complete hybrid drive trains with combustion engines, battery and inverter



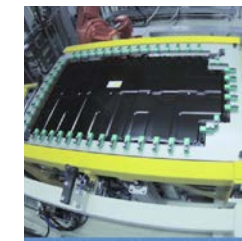
Customer advantages

- From coil preassembly up to the final test – turnkey
- Highest product quality by optimally designed systems
- Flexible production ramp-up – investment in several steps
- Experience of over 300 engine and transmissions test benches

Why choose thyssenkrupp System Engineering?



EPC Contractor



Battery assembly



E-Motor assembly



End of Line test benches



Software engineering

Customized Engineering



- Simultaneous Engineering
- Concept creation and consulting
- Visualization/Simulation/Digital factory

(E)ngineering (P)rocurement (C)onstruction



- Single machines/workstations
- Assembly lines
- Factories (Turnkey)

Service and Maintenance



- Training, coaching, production assistance
- Service and maintenance, spare parts
- Hotline worldwide

Project management excellence

PMI trained project management staff with multi discipline experience to launch projects on time and at rate.

High technology standard

Ongoing research and development enables us to deliver the latest technology to our customers.

Global team

Worldwide presence for service and support.

Automotive Technology
System Engineering

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