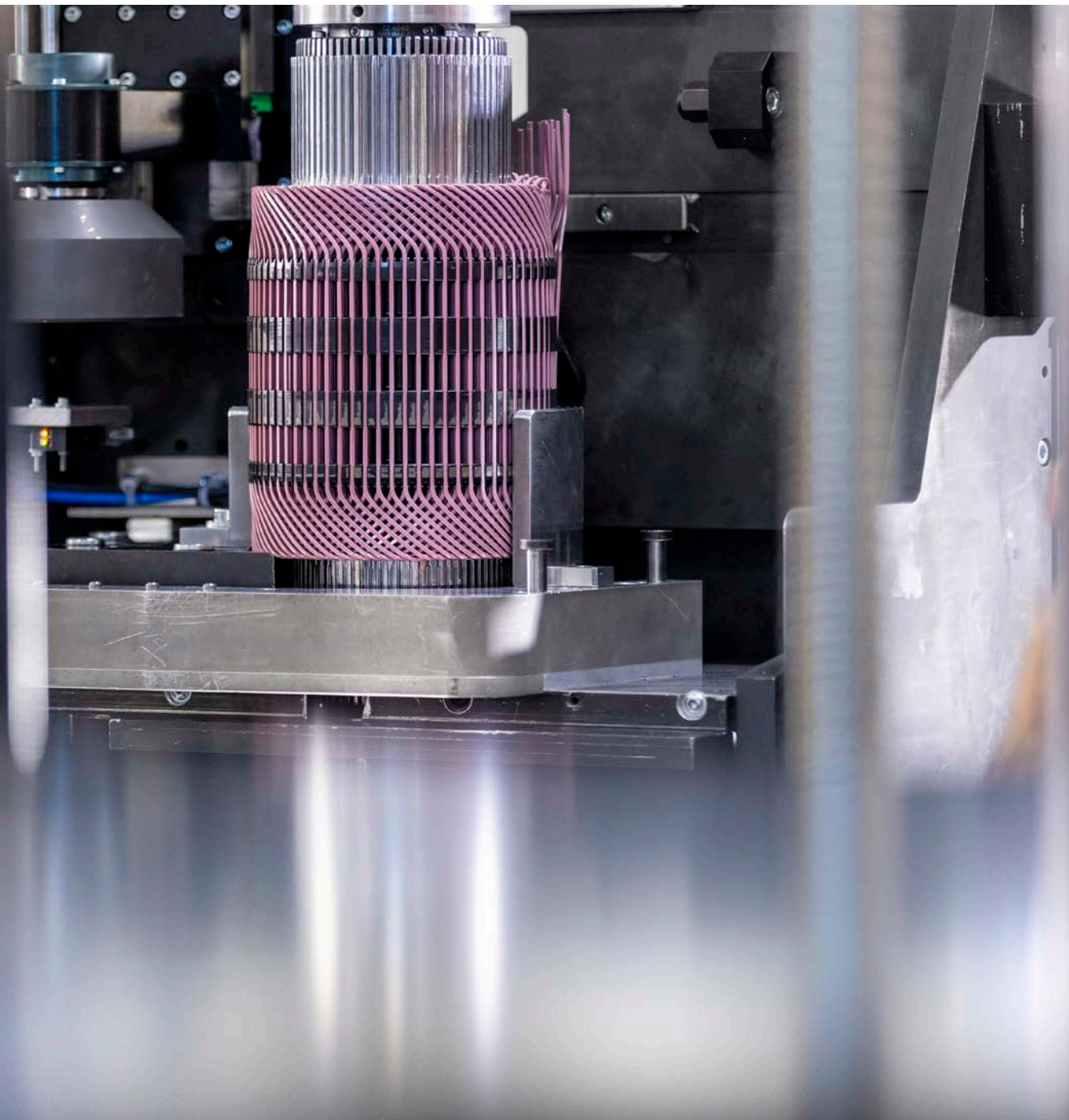


# Innovative winding technology for industrial & mobility applications



# More than 70 year of experience With winding technologies

## Properly wound. Moving the future.

For over 70 years, Schaeffler ELMOTEC STATOMAT has specialized in the development and manufacturing of innovative technologies for the production of copper coils. With numerous patents for stator winding, we are leaders in the industry and pioneers for our customers.

With our holistic approach, we support our customers as a competent industrialization partner throughout the entire life cycle of the production solutions. Our experienced team of technical sales, design engineers and programmers work together to develop individual customer concepts.

From procurement and assembly to final testing and commissioning at the customer's plant, our project management ensures that the production solution is implemented to our customers' satisfaction.

As a technology leader in the field of coil winding technology, with flat or round wire, we make an important contribution to a sustainable future.

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*Our winding technologies are used to realize  
highest copper fill factors, with energy  
efficiency and quality in focus.*

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## Our business fields

### Electric drives

move the world. From conveyor belts and pumps to industrial robots or vacuum cleaners and, more recently, electrified drive trains in electro-mobility. It is impossible to imagine the modern world without electric motors.

The challenges involved in manufacturing electric motors are just as various as the final applications. At Schaeffler ELMOTEC STATOMAT, we have therefore developed a broad portfolio of solutions for the different needs of the individual business areas. Whether the focus is on maximum flexibility or output quantity, we have a suitable concept for every application.



Stators for e-traction drives,  
alternators or steering motors



Pump motors in the industry for  
heating pumps, oil pumps or  
water pumps



Electric drives for industrial robots



Electric motors in application for  
consumer products

# Overall industrialization competence



Motor design & prototype manufacturing

## Design support and prototype manufacturing

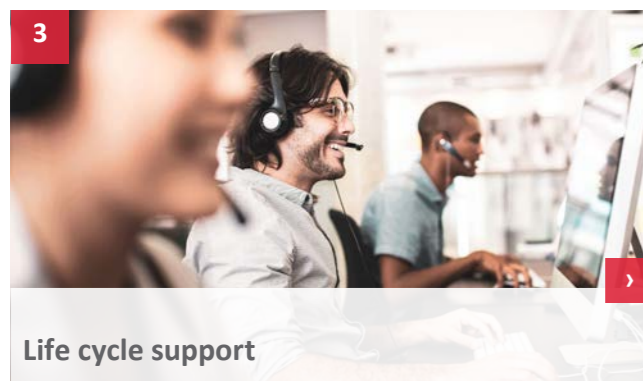
- Adapted to your requirements we develop innovative manufacturing solutions for your production
- For an economically optimal production process we deal with “design for manufacturing”
- Through “proof of concepts” and sample production we verify our solutions already in an early project phase



Processes & equipment

## Process development and realization of the product solution

- We develop holistic production systems, from the idea incl. tools to series production
- High-performance tested processes and proven winding technology as well as the dedication of our specialists enable us to achieve short realization times and efficient commissioning



Life cycle support

## Industrialization partner throughout the entire life cycle of production equipment

- We support our customers from the commissioning of production systems through production support to regular maintenance and spare parts deliveries
- For existing equipment, our team offers know-how for plant adaptations for new products as well as system and process optimizations up to complete retrofits

### Advantages for our customers

- Comprehensive understanding of the entire value chain from product requirements to production solutions
- Trustworthy partnership - one supplier for the entire equipment life cycle
- Modular design for product flexibility and scalable manufacturing capabilities

We consider ourselves as a reliable industrialization partner from the first prototypes to the final series production.

# Modular manufacturing equipment



Machines for slot isolation  
Manufacturing equipment for demanding speeds and precision.



Machines for flyer winding  
Flexible machine design for the realization of a wide range of variants.



Solutions for twist-free winding  
Production systems for a large number of parallel wires to achieve an optimal fill factor.



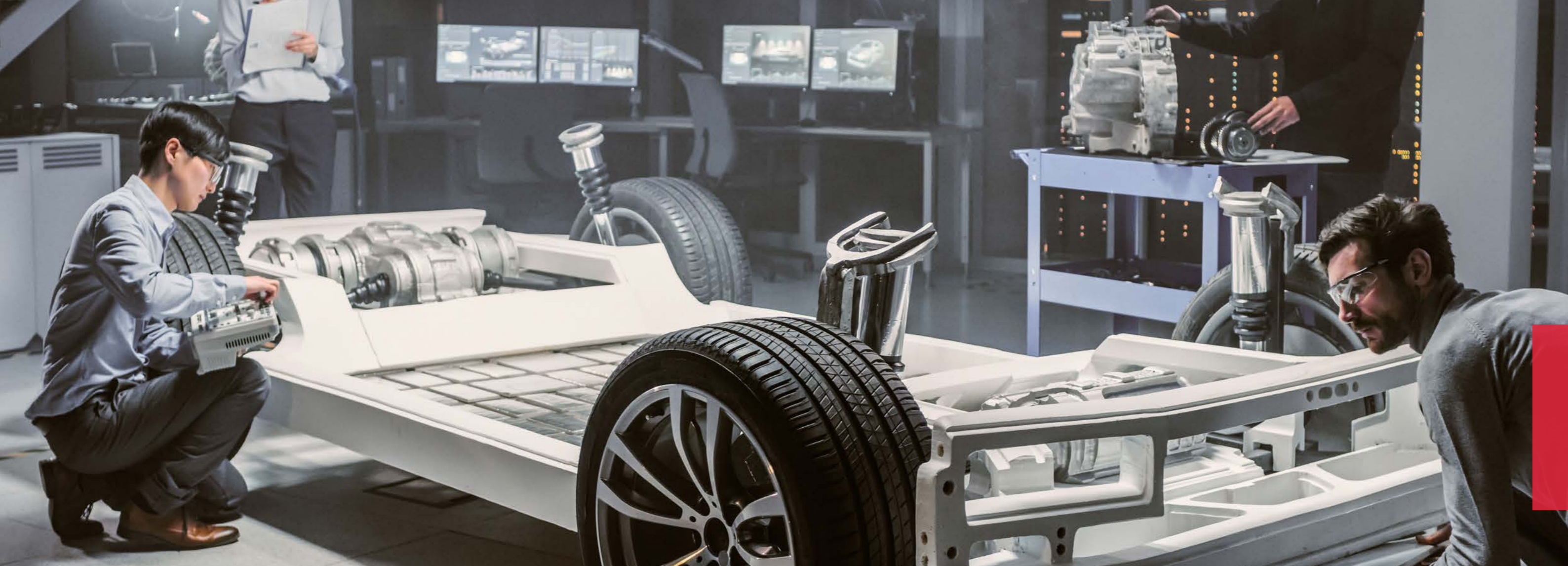
Winding and inserting centers  
Automated production solutions for high economic efficiency.



Forming machines  
Equipment for wire forming with minimum wire stress, for maximum quality.



Taping machines  
Production lines for high precision, efficiency and quality.



## Innovative manufacturing solutions for the growth markets of the future

4

Mega-trends determine our production solutions

80%

of automobile production in 2030 are estimated to be equipped with an electric drive

The growth markets of the future need innovative manufacturing concepts that enable resource-saving and highly efficient drive solutions:

### Urbanization

- New logistics and mobility concepts

### Climate change

- Accelerating the shift to electro-mobility with a focus on reducing CO2 emissions

### Scarce resources

- Increasing efficiency for electric motors while reducing the use of resources

### Digitalization

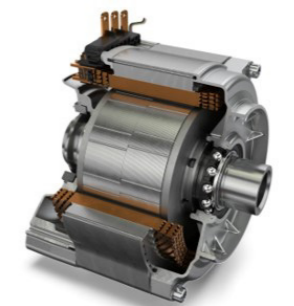
- Increasingly connected production requires intelligent systems, which increase the demand for industrial electric motors due to growing automation

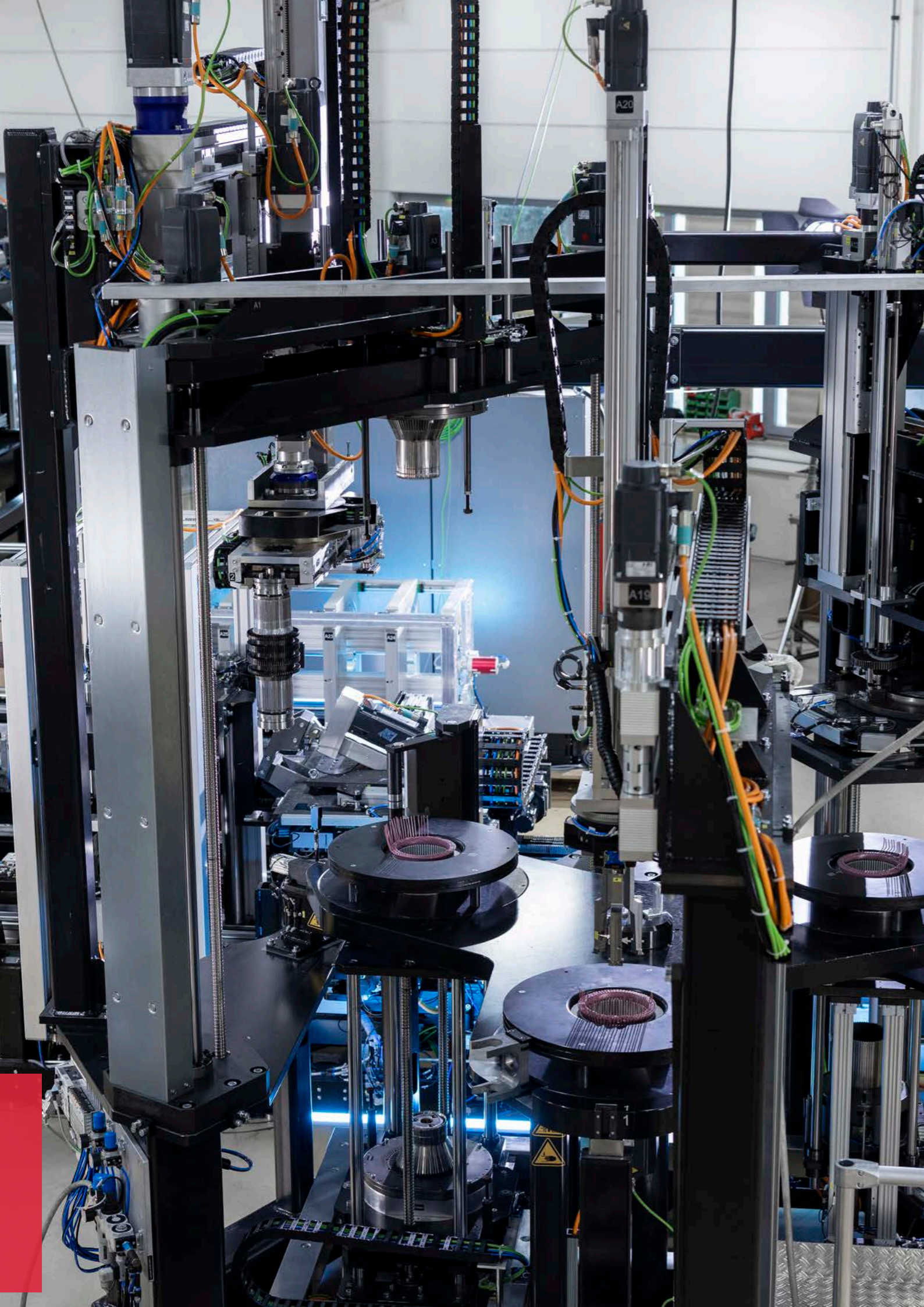
Schaeffler ELMOTEC STATOMAT offers the appropriate solutions.

## Industrialization partner for e-Mobility

From production lines to individual components and system solutions, our Schaeffler ELMOTEC STATOMAT team develops customer-specific production concepts. Over the last few years, we have implemented flexible and modular systems for the manufacturing of stators that find application in alternators, hybrid drives, e-axles, and electric auxiliary motors.

In order to achieve future consumption and emission targets for mobility, the Schaeffler Group already offers a wide range of products in series production. We achieve higher efficiency and performance through the use of innovative winding technologies, integrated cooling systems, and compact transmissions.





## Our future technology: Flat wire wave winding

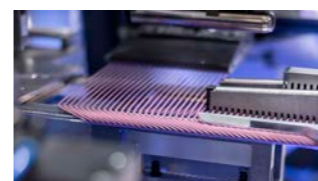
### Our production-ready flat wire wave winding technology

convinces with compact winding heads and is particularly efficient due to a high slot fill factor. A high number of windings ensure an optimum torque curve with maximum peak values. Our manufacturing technology for flat wire wave winding is characterized by very few welding points.

As a result, the manufacturing process is both fast, efficient and reliable in production compared with classic hairpin technology. The high savings in energy and CO2 make this technology ideal for the automotive production of the future.

### Highlights of the continuous flat wire wave winding:

- 100% wire testing and resistance symmetry by feeding from one coil
- Patented “U-Shape” technology
- High number of wire jumps to reduce losses
- Particularly suitable for stators with high number of conductors per slot (significant reduction of welding spots)
- Specially developed for high speed applications with highest efficiency and power density



Winding process



Twisting



Winding processing



Winding mounting

Our portfolio includes all core processes,  
fully automated and ready for use in series production:

- Wire preparation
- Winding of a continuous “winding mat”
- Wire jumping/wire crossing (“twisting”)
- Forming and wrapping
- Winding assembly
- Laser welding
- Slot insulation
- End-of-line tests

The flat wire wave winding  
technology

enables our customers to  
implement new drive concepts and  
set new standards in power density,  
in racing and in series production.

# Winding technologies for the industry business sector

**Our machines manufacture more than 10 million stators per year.**

At our customers' production sites, our lines run for batch sizes from one to approx. 20,000 stators per year, with a variance in package heights from 18 to 500 mm.

With our broad portfolio ranging from semi-automatic machines to fully automated production lines, we offer the right solution for many applications.

Our individual production steps include

- Packing
- Insulating
- Winding
- Inserting
- Forming
- Taping

Depending on your requirements, we can offer you the entire winding line or individual cells.

Another focus of our service spectrum is a simple handling technology and short set-up times of our lines.

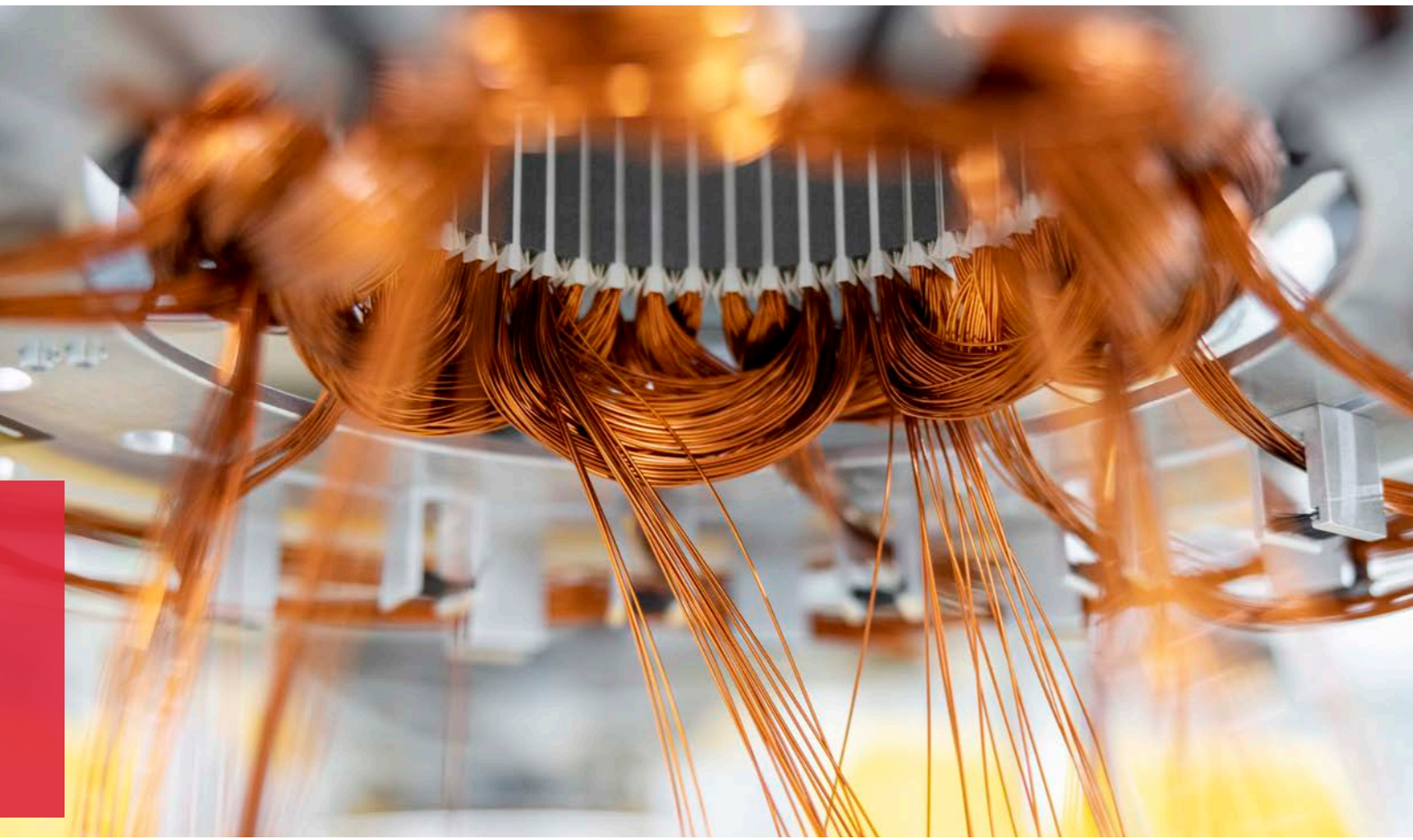
With our software solutions we support the digital integration into your production system.

# 88 %

We achieve up to 88% copper fill factors with our round wire insertion technology.

# 30

Our lines are designed for simultaneous, twist-free winding of up to 30 parallel wires.



# System competence together with Schaeffler Special Machinery

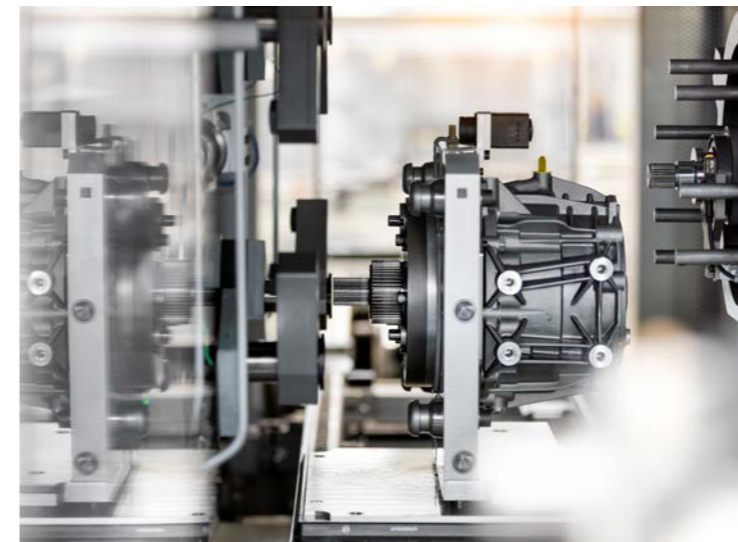


**Together with the Schaeffler Special Machinery,** we can offer our customers complete production lines for complex systems in addition to machines for stator production.

Our portfolio is thus supplemented by

- Assembly and testing systems
- Handling and feeding technology
- Vision systems
- Robotics
- Production IT

We achieve an international presence through our worldwide Special Machinery network.



**Our concepts for flexible production lines** for hybrid modules or e-axes are in use worldwide. Technologically advanced fully automatic processes such as magnetizing the rotor magnets, multidimensional unbalance correction and functional testing across the entire performance spectrum are combined in the lines with ergonomically optimized manual workstations. In particular, our EOL testing systems are unrivaled high-performance systems. Their functional scope includes the testing of the function, the acoustic properties as well as the drag torque and the parking lock in addition to the recording of the efficiency of each gearbox in an individual power run.



**Together, we develop solutions for the production of tomorrow.**

In a close exchange, our specialists realize concepts for smart automated, efficient and climate-neutral production.

Together with our customers, we continuously analyze processes and concepts, look for innovative production approaches, develop optimizations and thus sustainably improve the competitiveness of our customers.

# Our service around innovative winding technologies

## With our team of specialists

we accompany our customers from the idea over the development up to the design and realization of their systems.



### Consulting

In the first phases of product development we offer support to develop individual product designs.



### Planning & project engineering

Tailor-made to the requirements, we plan lean and innovative solutions that fit optimally into the existing value stream.



### Design & construction

With our 3D-supported CAD-system we simulate and construct the system concept.



### Project & quality management

Quality, cost compliance and delivery reliability are our living corporate culture, which we use as a benchmark for all our projects.



### Innovation

The innovation department drives technological progress in our company. Hand in hand with design and assembly, we realize new solutions.



### Customer training & service

Securing your production availability is our top priority at Schaeffler ELMOTEC STATOMAT. Our experienced service team is on site for you worldwide - around the clock. Whether remote maintenance or operator training, our customers can rely on comprehensive service.



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All information has been carefully prepared and checked.

For possible errors or incompleteness, however, we can assume any liability.

We reserve the right to make technical changes.

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