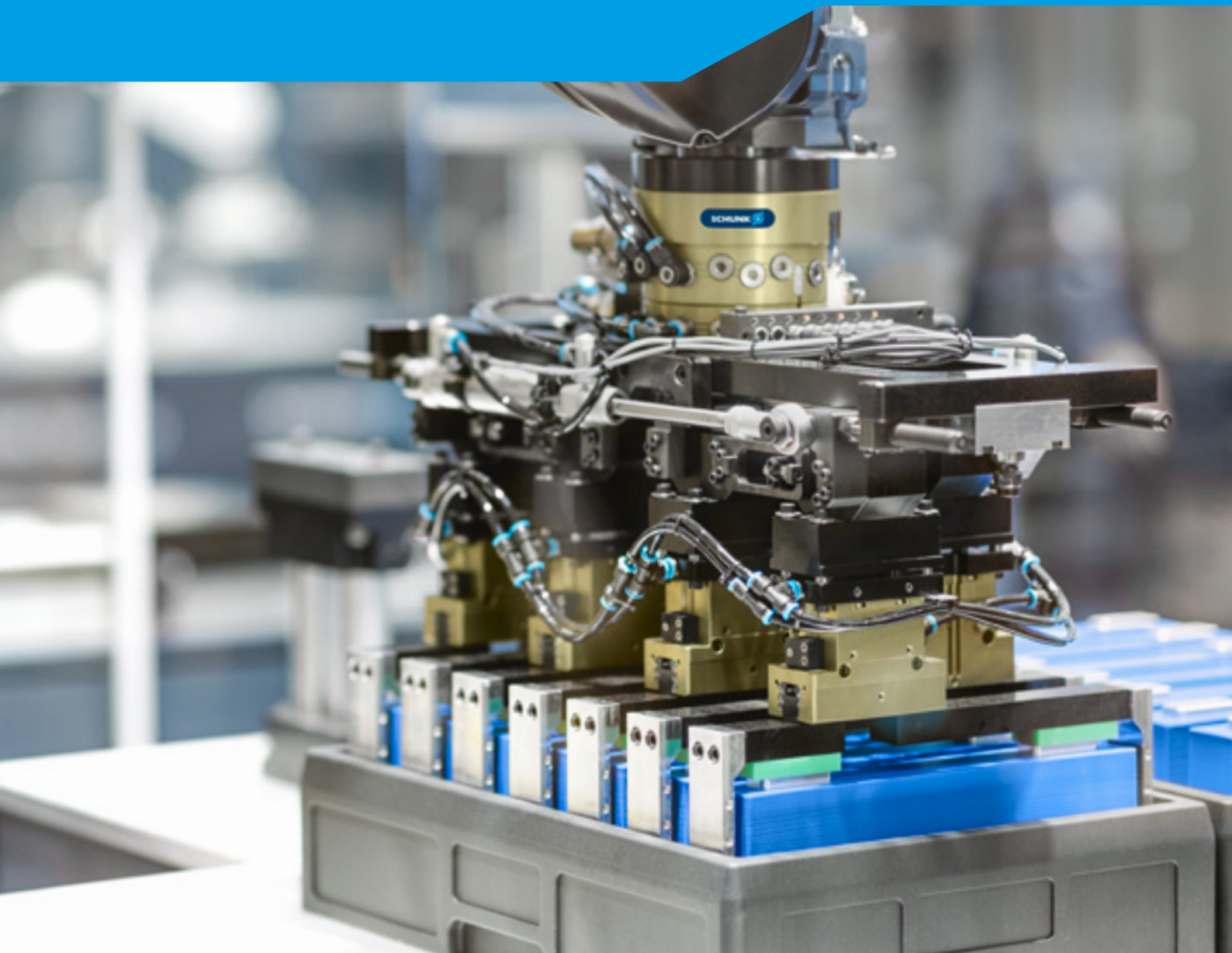


Product portfolio for battery production

SCHUNK E-Mobility

Hand in hand for tomorrow



Product portfolio for battery production

The production of battery cells poses new challenges for machine manufacturers and their components. To ensure the safety and quality of the end product, strict requirements apply in terms of technical cleanliness, ambient conditions, and the materials used. These standards are essential to ensure the highest production quality and the longevity of the batteries.

Material requirements

Alloying elements and metals



Materials such as copper, zinc, or brass must be avoided in battery production, as they can impair the quality of the cells due to short circuits or corrosion. Instead, corrosion-resistant materials such as stainless steel, aluminum AW7075, or coated tool steel are used.

SCHUNK relies on a high-strength aluminum that is especially suitable for the requirements of battery production. This alloy is used both uncoated and with a high-quality anodization, which provides additional corrosion protection and ensures suitability for cleanroom applications.

Lubricant



The lubricant used in battery production must not contain lithium in order to avoid chemical interactions. It must retain its lubricating properties even at low humidity levels in order to prevent premature wear and ensure process reliability.

The lubricants used by SCHUNK are especially suitable for dry room environments. They retain their full functionality even at extremely low pressure dew points of -50°C to -80°C and ensure reliable lubrication. In addition, they do not contain any critical substances that could impair battery production.

Material requirements



Environmental requirements

Dry room: protection from moisture



Dry rooms are essential to protect sensitive materials such as electrodes from moisture during battery production. These materials are hygroscopic and could absorb moisture from the air, which could have a negative impact on the quality of the batteries.

By using lubricants suitable for dry room applications and testing our components in dry rooms, SCHUNK ensures that the consistently high quality of our products is also guaranteed in this environment.

Controlled ambient temperature



A constant temperature in the range of 20°C to 25°C is crucial for the quality of the battery cells. Chemical reactions run optimally at stable temperatures, which increases process reliability.

The SCHUNK standard portfolio operates reliably in controlled temperature environments.

ESD protection: safety in the process



Electrostatic discharges can damage components in battery production and pose a high safety risk. ESD protection is therefore an essential part of the production process.

The requirements for protection against electrostatic discharge (ESD) are reliably met by the SCHUNK standard portfolio and pose no particular challenges.

Cleanroom: avoiding contamination



Cleanroom requirements are necessary to protect sensitive materials from particles, dust, and other contaminants. These could disrupt chemical reactions, damage electrodes, or cause short circuits, which could jeopardize the safety and service life of the batteries.

Many SCHUNK products are already developed with cleanroom applications in mind and fulfill these requirements as standard. Cleanroom certification is carried out by independent test centers that officially certify the products for use in cleanrooms.

*For details, see next double page

Environmental requirement: Cleanroom



Cleanroom standards are essential in battery production to protect sensitive materials from contamination. Each component must comply with the required ISO classes in order to avoid short circuits, loss of performance, or a shorter battery life. SCHUNK offers a broad portfolio of standard components that are certified for use in cleanrooms.

Gripping technology

1 2 3 4 5 6 7 8 9 → Cleanroom classes according ISO-classification 14644-1

Pneumatic



DPG-plus



PZN-plus



DPZ-plus



MPZ



MPG-plus



PGL-plus-P



PGN-plus-P



KGG

Mechatronic



EGP



EGU



EGK

Interested?

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Automation technology

Pneumatic



SRM

Mechatronic



ELP



Beta



PPU-E

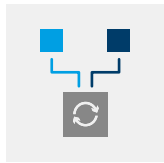


ERD



SLD

Production process in battery production



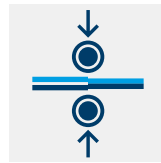
Mixing



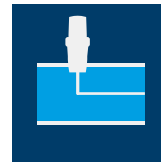
Coating



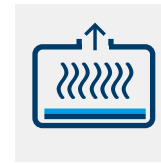
Drying



Calendering



Slitting



Vacuum
drying



Stacking

SCHUNK products along the value chain

Slitting

Precision through hydraulic expansion technology

Calendering and slitting – two essential roll-to-roll processes in battery production – focus on precision and efficiency. Especially when slitting, it is crucial to clamp cutting blades precisely in order to ensure a consistent cutting quality. At the same time, blade changes must be quick and straightforward in order to minimize downtimes in the production process.

Hydraulic expansion arbors offer the ideal solution for this. They enable low-vibration clamping and ensure high process stability. This results in precise cuts and an efficient production method – tailored to the requirements of modern battery production.



SCHUNK solution: hydraulic expansion arbor

- + High-precision clamping of the cutting blades
- + Quick exchange in case of wear
- + Low-vibration operation for consistent cutting quality

Stacking

Precise handling of electrodes for pouch and prismatic cells

When stacking or Z-folding anodes and cathodes, the focus is on precise positioning of the electrode layers and high process speed. Even the smallest inaccuracies can lead to faulty stacks, which must be avoided at all costs due to the high manufacturing costs.

The use of independent movement axes and specialized gripper units enables precise handling of the electrode layers. The parallelization of the stations through stacking on both sides also ensures shorter cycle times and an increased output rate.



SCHUNK solution: stacking unit

- + Reduced cycle times and higher output rate thanks to parallel working
- + Precise stacking of the anode and cathode to avoid rejects
- + Reliable and gentle handling of sensitive materials



Packaging

Safe transportation without displacement

After winding the jelly roll or stacking the anode and cathode, the challenge remains to safely transport the layers of the stack. It is essential to prevent the layers from slipping, as this could impair the quality and functionality of the stack.

With specially developed handling solutions, such as parallel grippers and adjustable top jaws, the cell stack is held securely. Coating materials increase the holding force, reduce the required gripping force, and minimize surface pressure, thereby preventing damage to the stack. Hold-down clamps provide additional stability during transportation.



SCHUNK solution: handling unit

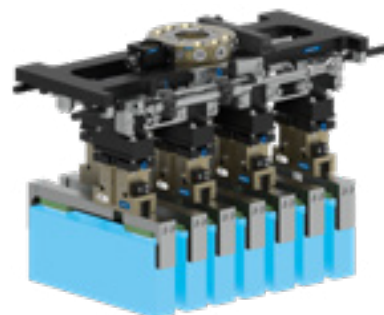
- + Safe transportation of the cell stack thanks to precise gripping solutions
- + Prevention of damage thanks to optimized holding and gripping technology
- + Reliable protection against layer displacement with high process reliability

Formatting & Aging

Efficient charging and discharging of batteries

In the formatting & aging process step, newly produced battery cells undergo initial charging and discharging cycles to chemically activate the electrodes and form a protective layer (SEI – Solid Electrolyte Interface) on the anode. During this phase, the cells are stored and activated in batches. Flexible handling solutions are essential to efficiently manage the high production volumes and short cycle times.

With comprehensive engineering expertise, end-of-arm tooling solutions are developed that are specifically tailored to the requirements of this process. These solutions ensure safe handling of the sensitive cells and optimize process reliability.



SCHUNK solution: multiple gripper unit

- + Pitch adjustment possible with cell spacing unit
- + Compensation units compensate for inaccuracies in order to achieve maximum precision
- + Parallel gripper and coated top jaws for safe and precise handling of the cells



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