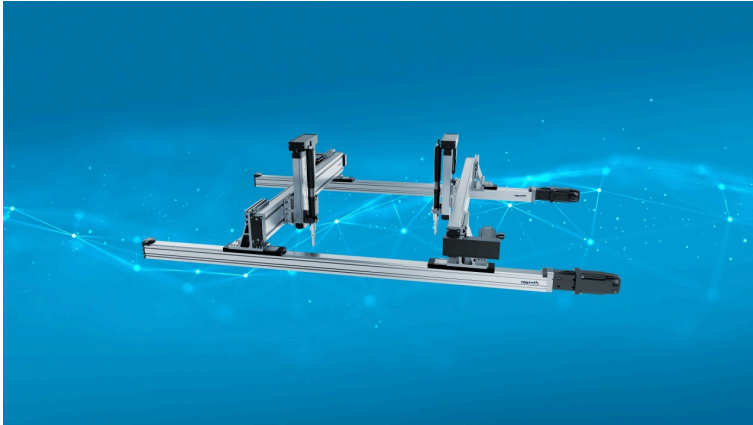


PRESS INFORMATION

Linear motion technology for battery production: five tips to really take the lead

Manuela Kessler | 08.10.2024 | Lohr am Main / Germany | PI 034/24

How mechanical and plant engineering can economically meet the high requirements in battery production for linear guides



Highly efficient battery production: powerful guideways in the linear modules of this linear robot with two individual YZ units allow peak values to be achieved in terms of speed, precision, and repeatability. (Image source: Bosch Rexroth AG)

Battery production requires fast, efficient, and repeatable processes. Linear guides play a key role here, as they have to move different loads highly dynamically and position them precisely. The following tips show how mechanical and plant engineering can optimally meet the diverse requirements along the value stream.

1. Resistant materials for dry rooms and electrolyte contact

For electrolyte and cell production right at the beginning of the value stream, the following selection criteria are decisive for linear guides: the materials used must be suitable for the dry room and must withstand the corrosive effect of the electrolytes. To prevent plastics from becoming porous and aging prematurely in the dry room due to the highly dehumidified air, Bosch Rexroth uses materials suitable for dry rooms, such as polyacetal (POM) or thermoplastic elastomers (TPE), including suitable adhesives, lubricants, and sealants, for almost all components. Guideways with corrosion-resistant materials (NR 2) and hard chromium plating are also part of the portfolio.

2. Higher productivity through high-performance components

Battery production requires highly efficient processes, which is why the linear guides used must also perform extremely well. For example, the precise guidance of distance control in roll-to-roll processes such as calendaring (rolling) or slitting (cutting). The high-performance ball rail systems BSHP from Bosch Rexroth carry out such tasks accurately and reliably thanks to extremely exact rail surfaces and vibration-optimized runner blocks.

For short cycle times, belt-driven Rexroth ball rail systems achieve acceleration values of up to 50 m/s² and speeds of up to 5 m/s. Versions with cam rollers and high-speed runner blocks achieve a record-breaking 10 m/s.

When laser cutting electrode foils for any type of battery cell, the IMS position measuring system integrated into the linear guide, combined with linear motors, ensures maximum efficiency with minimum tolerances. The non-contact and wear-free measuring principle with decoder integrated in the runner block is insensitive to contamination and achieves a comparable repeatability to glass scales of up to $\pm 0.25 \mu\text{m}$. The shock and dynamic characteristics correspond to the respective underlying linear guide.

3. Wide range of requirements covered from a single source

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Bosch Rexroth offers a finely graduated portfolio of linear axes with ball screw assembly or toothed belt drive, various types of seals, and accessories for the various applications along the value stream. Laser welding or contacting machines, for example, can be realized compactly and economically with the complementary linear motor modules.

4. Can be used, combined, and integrated flexibly

Module and pack assembly also benefits from high-performance linear guides, which can be combined to form ready-to-use linear axes and cartesian robots. Compared to industrial robots, linear robots often boast higher precision, dynamics, and compactness thanks to their mechanical properties. Their range of applications covers handling, screwing, and dosing processes as well as camera transport in end-of-line testing (EOL).

At Bosch Rexroth, selection, sizing, and configuration are carried out quickly and intuitively using e-tools. With the Smart Function Kits, pre-installed user software significantly shortens commissioning and program creation. On this basis, Bosch Rexroth also creates customer-specific solutions, such as gantry robots for loading, filling, sealing or gluing, screwing or welding.

5. Finding sustainable solutions

Linear components and solutions for battery production must also offer a high degree of reliability and sustainability. Bosch Rexroth's long-life linear guides implement the required movements with minimal energy loss and lubricant consumption. Maintenance-free applications, flexible interchangeability, and the exact calculation of relubrication intervals up to the total service life contribute to lower resource consumption.

Basic Information Bosch Rexroth

As one of the world's leading suppliers of drive and control technologies, Bosch Rexroth ensures efficient, powerful and safe movement in machines and systems of any size. The company bundles global application experience in the market segments of Mobile and Industrial Applications as well as Factory Automation. With its intelligent components, customized system solutions, engineering and services, Bosch Rexroth is creating the necessary environment for fully connected applications. Bosch Rexroth offers its customers hydraulics, electric drive and control technology, gear technology and linear motion and assembly technology, including software and interfaces to the Internet of Things. With locations in over 80 countries, around 33,800 associates generated sales revenue of 7.6 billion euros in 2023.

Basic Information Bosch

The Bosch Group is a leading global supplier of technology and services. It employs roughly 429,000 associates worldwide (as of December 31, 2023). The company generated sales of 91.6 billion euros in 2023. Its operations are divided into four business sectors: Mobility, Industrial Technology, Consumer Goods, and Energy and Building Technology. With its business activities, the company aims to use technology to help shape universal trends such as automation, electrification, digitalization, connectivity, and an orientation to sustainability. In this context, Bosch's broad diversification across regions and industries strengthens its innovativeness and robustness. Bosch uses its proven expertise in sensor technology, software, and services to offer customers cross-domain solutions from a single source. It also applies its expertise in connectivity and artificial intelligence in order to develop and manufacture user-friendly, sustainable products. With technology that is "Invented for life," Bosch wants to help improve quality of life and conserve natural resources. The Bosch Group comprises Robert Bosch GmbH and its roughly 470 subsidiary and regional companies in over 60 countries. Including sales and service partners, Bosch's global manufacturing, engineering, and sales network covers nearly every country in the world. Bosch's innovative strength is key to the company's further development. At 136 locations across the globe, Bosch employs some 90,000 associates in research and development, of which nearly 48,000 are software engineers.

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