SMC

Expertise – Passion – Automation

Our battery of expertise for reliable production

SMC solutions for battery manufacturing

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The battery industry has become increasingly popular in recent years, given that its field of use has expanded from small electronic devices, such as smartphones and tablet PCs, to hybrid and electric vehicles, large-capacity energy storage devices, and robot industries such as drones. This industry has an estimated Compound Annual Growth Rate (CAGR) of more than 15 % during 2022 and 2027. The main reason for such a favourable performance is the upward trend in electric vehicles, registering a CAGR of approximately 23.35 % during 2022 and 2027, where lithium-ion batteries in particular are being used.

The production of batteries presents customers with big challenges, given that ensuring high safety levels is a must, whilst always being aware of environmental issues. Furthermore, having the agility and speed the market demands is the way to ensure an optimum time-to-market in such an exponentially growing industry.

> **SMC** *has, for years, been supplying components to leading global battery manufacturers, located mainly in Asia and that are expanding worldwide. The expertise and know-how we have acquired during this time is our main strength to help our customers face the new challenges of the industry.*

In the following pages you will find an overview of the battery manufacturing process, together with a brief explanation of the solutions that SMC can provide for these environments and the conditions that they should fulfil for reaching the goal customers are seeking, improving productivity and reducing defects.

Mr. Saeyeong Jeong, Team lead Battery Industry, SMC CEE.

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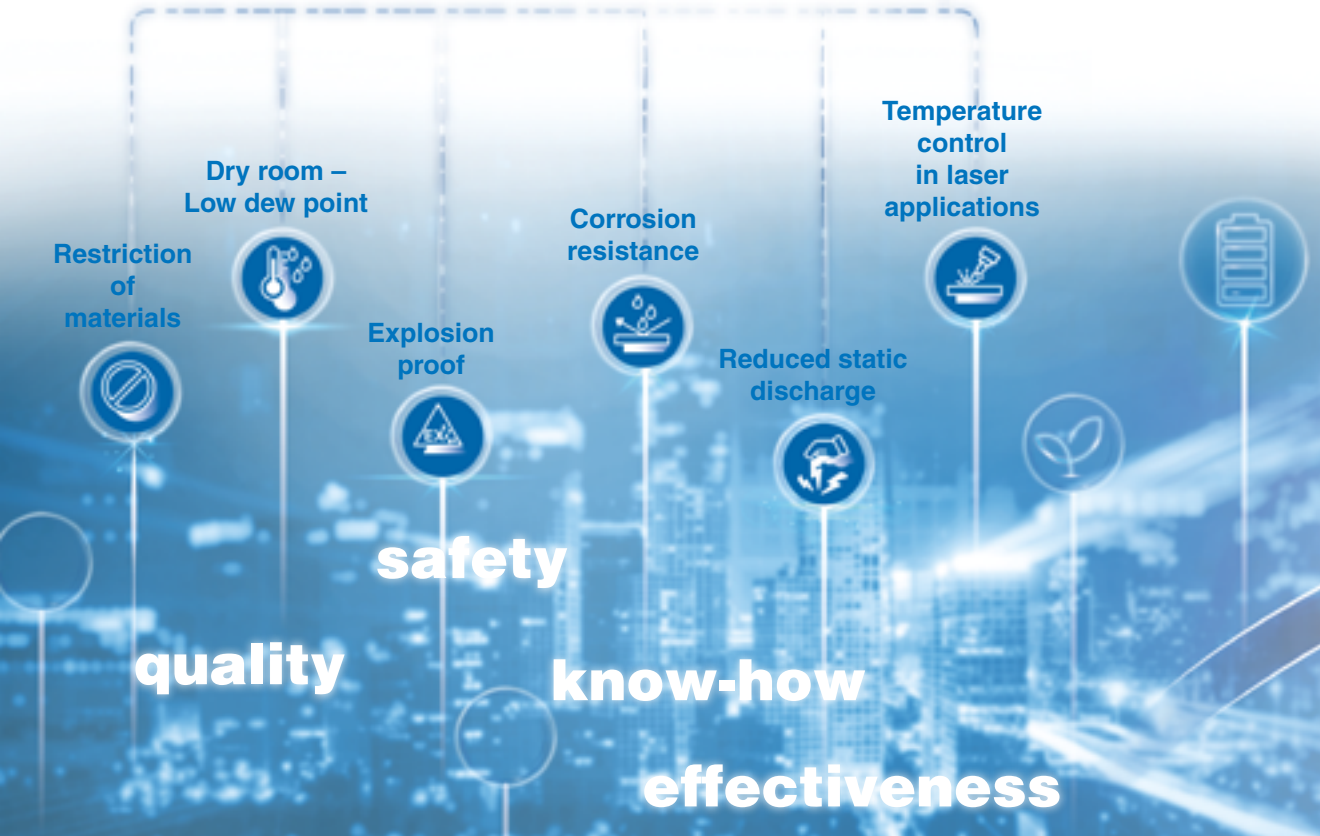


Mr. Achim Goelter, Sales Manager Machinery, SMC DE

As the utilization and demand for batteries increase, the required performance standards such as energy density, cost, lifespan, output and safety are also gradually increasing. To satisfy the increasing performance standards, battery manufacturers are taking designs to extreme areas, and accordingly, various problems have been reported, such as the ones below.

Several ignition accidents have occurred with the lithium-ion batteries in the last few years, raising concerns about this industry. Since this is a problem that is directly related to human life, battery manufacturers are doing their best to avoid these issues. These are mainly caused by metal foreign substances that could enter the battery cell, such as copper, zinc or nickel, that may damage the separator, resulting in poor quality or explosion/ignition. To avoid these problems SMC offers the 2SA series, restricting the use of the above-mentioned materials as main components and using a special grease compatible with low dew points to ensure quality, stability and safety.

Furthermore, in a process that handles low ignition point material such as electrolyte, it is necessary to minimise problems that may occur by using manufacturing equipment and mechanical parts specialised for the characteristics of the process.

SMC has already joined many customers on the journey to ensure safety, and to reduce the defect rate of products that may occur in the battery manufacturing process by working together from the outset in the mechanical design stage, and this has been verified in the field for a long time.

This is the reason why battery manufacturers, who are currently leading the market, have chosen SMC products as their top priority, and why SMC is constantly receiving calls.

We are aware of the conditions your process requires

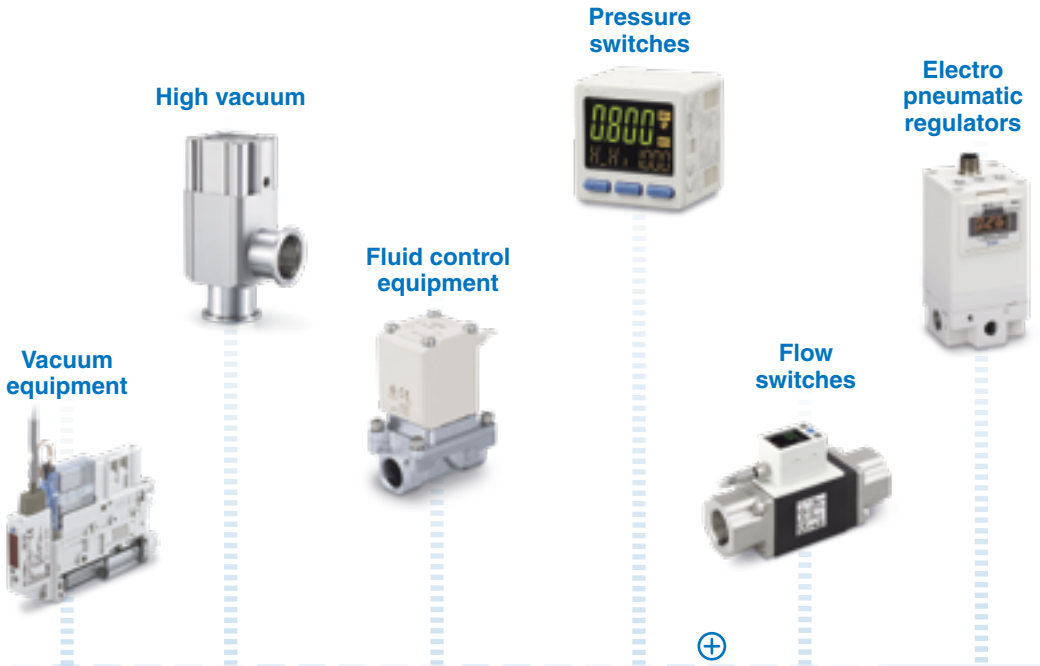
Restriction of materials

To ensure the quality and safety of the batteries, it is necessary to restrict the use of some unnecessary materials such as copper, zinc, nickel, electrolytic nickel plating with a copper layer or zinc plating during the electrode and assembly production process, before the battery cell is sealed.

What happens if metallic particles flow into the battery cells?

They could act as an intermediary that connects anode and cathode, leading to chemical reactions inside the cell, thus leading to battery quality problems, heat or even explosions.

*SMC's products that are compatible with the battery production environment, **25A series**, restrict the use of the above-mentioned materials to reduce defects and ensure safety during the battery manufacturing process.*



• Wide range of compatible products for battery manufacturing – 25A Series
• More than 200 basic models


Airline equipment


Directional control valves


Actuators and grippers


Fitting and tubing


Electric actuators

Dry room - Low dew point

Battery production is carried out in a dry-room environment with a pressure dew point of -50 °C or even lower, given that humidity is one of the main threats to the battery production process.

How will dry environment affect to your process?

Due to this extreme dry environment, the grease applied to the pneumatic product can dry out and compromise lubrication performance, thereby shortening its lifespan and causing air leakages. This could lead to reduced productivity and increased product defects.

*The previously mentioned **25A series** use a special grease that ensures perfect performance, even in dry-room environments with dew point as low as -80 °C.*

Make the most from reduced lead times and put products to work at the earliest opportunity thanks to the European production and stock of various 25A series.

Explosion proof

The process of filling a battery cell with a highly corrosive electrolyte has a high risk of fire/explosion due to the characteristics of the electrolyte, which has a very low ignition point.

In addition, to activate the battery during the formation process, charging and discharging are repeated at predetermined time intervals. This may cause a thermal runaway which could lead to ignition.

How can we avoid these kinds of issues?

As the battery manufacturing processes will be held in a potentially explosive atmosphere, according to the ATEX Directive, it is necessary to use certified explosion-proof equipment to prevent the generation of ignition sources.

SMC offers its customers a wide range of products meeting the ATEX Directive such as solenoid valves, serial transmission systems, air cylinders, auto switches and process valves, which are certified as explosion-proof in various protection categories.

Actuators

Solenoid valves

Auto-switches

Pressure switches

Corrosion resistance

During the electrolyte filling in the cell assembly process, corrosion of the pneumatic products may occur due to the nature of the electrolyte. Resin-based products are hardened when exposed to the electrolyte for a long time and are more susceptible to be damaged by external impact and vibration, thus generating foreign substances in the environment.

Which kind of products should be used?

Corrosion-resistant and chemical-resistant products are required in the electrolyte filling process such as high purity products, stainless-steel cylinders and fittings.

SMC supplies products with excellent resistance to corrosion and chemicals as required by the battery manufacturing environment.

High purity fittings

High purity chemical liquid valve

Stainless steel fittings

Stainless steel actuators

Reduced static discharge

Static electricity is an invisible enemy that can create serious problems in the battery manufacturing process. In an environment with a high static charge, the chances of explosions and fires increase significantly due to this unseen phenomenon. Dust is also attracted to the manufacturing process and contaminating particles can adhere to the batteries.

Where will problems caused by static electricity appear?

Static electricity generation occurs easily in environments where the air humidity is below 50 %. In the manufacturing of batteries, mainly in the creation of the electrode and in the battery cell assembly, the average humidity is less than 35 %.

Therefore, use SMC's wide range of ionizers for measuring, removing and controlling static electricity and guarantee final product quality.

Bar type ionizer

Nozzle type ionizer

Fan type ionizer

Antistatic fitting

Temperature control in laser applications

From the notching to the tap welding process of the battery cells, there are many laser applications in the battery manufacturing process. Incorrect temperature control can cause equipment overheating and failure, resulting in reduced productivity and product defects.

What are the advantages of proper temperature control?

The use of thermo-chillers makes it possible to maintain the temperature of the heat generating devices, lasers in this case, within strict limits. This proper temperature control increases the productivity, maximises the machine performance, and improves the quality, reliability and service life of the equipment.

SMC provides a variety of precise temperature control equipment, including chillers for the temperature control of laser applications as well as the filters and flow switches used in piping for them.

Standard type chiller

Dual channel type chiller

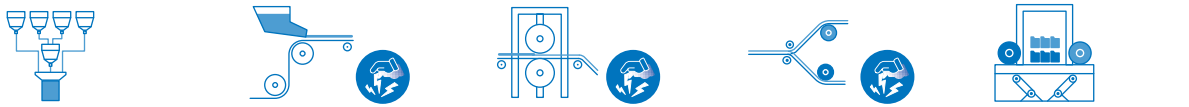
Rack mount type chiller

Stainless steel S couple

We join you on the road to reliability

Each part of the battery manufacturing process will vary depending not only on the battery manufacturer, but also on the environmental requirements that the different components will have to fulfil. Understanding and complying with the different conditions throughout the process is the key for achieving the reliability you seek, **guaranteeing crucial aspects such as quality, safety and effectiveness**.

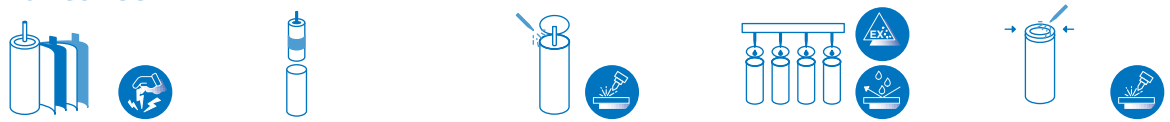
1 Electrode



Mixing | Coating and drying | Pressing/ Calendering | Slitting | Vacuum drying

2 Cell assembly

A Cylindrical cell



Winding | Jelly roll insert | Tab welding | E/L filling | Crimping/Welding

B Pouch cell

Notching/ Punching | Stacking | Tab welding | Pouch forming | E/L filling | Pre-charging | Sealing

C Prismatic cell

Winding | Jelly-roll press | Tab welding | Jelly roll insert | Cell lid welding | E/L filling | Pre-charging | Welding infusion plug

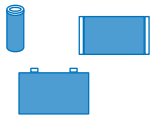
3 Formation


Charging and discharging


Aging


Degassing


Inspection and grading

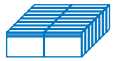

Finalised cell

4 Battery module


Stacking cells

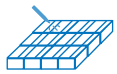

Contacting cells

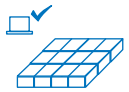

Inspection


Finalised module

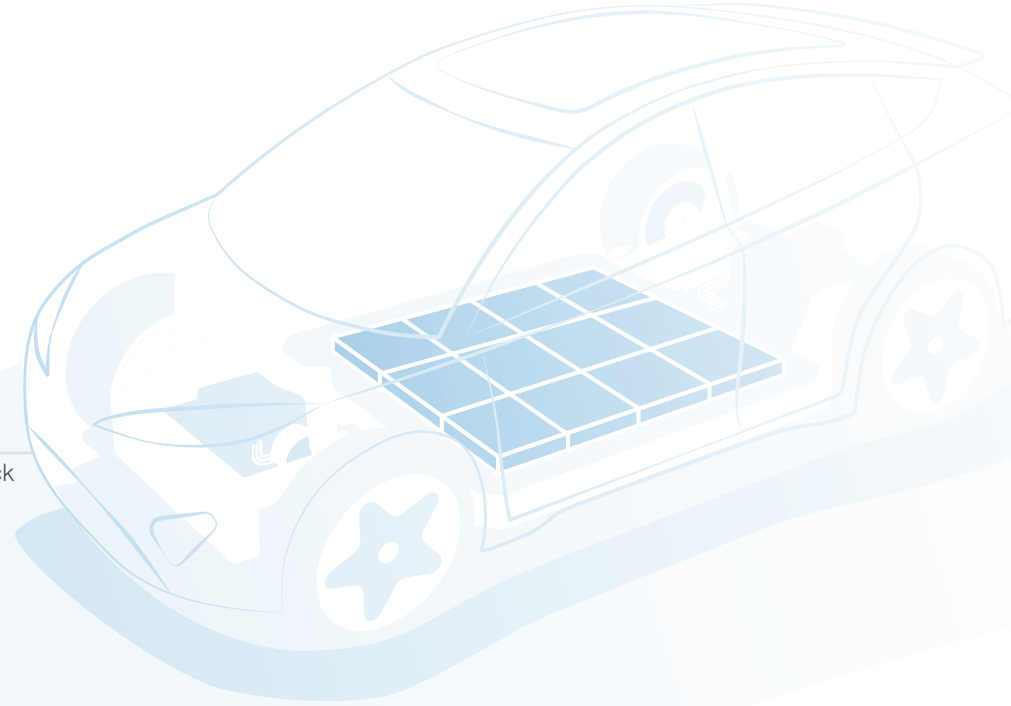
5 Battery pack


Stacking modules


Contacting modules


Inspection

Finalised pack



Industrial maintenance

It's no secret that maintenance is the key to the prevention of problems, cost savings and improvement in productivity and that is why it has become a fundamental aspect of the everyday reality of production lines. With the solutions that SMC can provide to achieve successful maintenance actions you will find the best way to improve the efficiency and productivity of your process.

Smart Flexibility

This is the main concern of the Industry 4.0, Factory of the Future, Smart Factory or Digitalisation, you name it. It is no longer a question of mass production, but to do so in a personalised, cost-effective, fast and sustainable way.

We understand your daily needs

Our local teams of highly trained experts are on hand to help you achieve your goals

Your safety in our focus

Creating confidence with confidence. SMC is an innovative, reliable and strong partner for pneumatic and electrical automation technology. We accompany our customers throughout the entire life cycle of their plant and, for all relevant safety issues, we have competent and professional solutions at your disposal.

Energise your efficiency

In our 24/7 economy and as governments, industries and consumers battle with in the quest for ever increasing supplies of energy, SMC has always been fully committed to assisting customers in reducing their bills and, of course, in making its modest contribution to global sustainability.

Size & weight optimisation

Nowadays space and weight are at a premium. SMC is on the way to downsizing your machine components, continually re-designing our products so you can achieve more efficient, compact and light machinery.

SMC Business Continuity Plan

Discover more on SMC Business Continuity Plan

Sustainable growth also means ensuring uninterrupted operations

We are committed to ensuring that SMC is prepared for any emergency and that our business activities will not stop in the event of such circumstances. SMC aims to fulfil our product supply responsibilities and maintain our customers' trust by contributing to both sustainable growth and the expansion of technological innovations.

SMC, as a comprehensive manufacturer of automatic control equipment that supports automation, is able to promptly provide products that meet our customers' needs anywhere in the world.

Finance BCP

Safe & Solid financial base

In the event of an emergency, SMC can provide a safe and solid financial base (with cash, deposits, and equity capital) that will sufficiently cover the working capital and funds needed to rebuild buildings and the equipment required for business continuity. This is done to provide peace of mind to our customers and workers alike.

Information security BCP

Vital data kept safe

Strengthen information security for protection against computer viruses and cyberattacks, plus the installation of data centres to establish a disaster recovery system. Your information is safe with us.

Sales BCP

Consistent sales support

8,700 sales engineers worldwide ready to recommend the best solution for you.
83 global locations to make sure that wherever you are, we are there too.

Production BCP

Ensure customer order fulfilment

Reliable delivery for you thanks to our 8 global logistic centres and 34 production sites, 10 of which are located in Europe. Moreover, flexibility to rapidly respond to any sudden change in the manufacturing environment.

Aiming to gain your trust Sustainability through reliability

Engineering BCP

Consistent technical support

1,700 engineers at our 5 technical centres around the globe (2 in Europe - Germany and UK).

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www.smc.eu
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