Qlar

Scale up your battery production

Weighing and feeding solutions for battery cell production

Solutions for **batteries**

Great batteries
start with perfect conditions

Battery cell production is complex. Maximum precision and protection for employees and the environment are required. This is because producers of lithium-ion batteries have to handle materials that are difficult to process, in some cases highly flammable and highly toxic.

Weighers and feeders must therefore meet the continuously increasing requirements for minimizing dust emissions and ensure the highest process reliability in the field of component feeding.

Qlar provides high-quality technologies for ideal weighing and feeding processes in large-scale battery cell production. That help to bridge the gap between pilot installations and large giga factory scale ups.

Our expertise in various industries makes Qlar your top partner in handling and preparing raw materials and electrode slurry in the most reliable, efficient, hermetic, and safe way.

The battery production process is one of the longest and most complex process chains. Starting with ore mining, through chemical plants for the production of raw materials to mixing, coating and assembly in a giga factory. Qlar machines/equipment can be used for metering materials in raw material production (sulfate synthesis, lithium refining, PCAM and cam production, etc.) and sludge processing.

Two different types of processes are possible for weighing and mixing raw materials in battery production. In continuous processes, the material is continuously weighed and dosed; in batch processes, there are breaks between weighing and dosing processes.

We support you with a dedicated team for developing, engineering, testing and building your individual feeding solution to increase quality and lower costs for your entire manufacturing chain. The beginning of the whole chain in the production of the battery mass is the crucial part, that determines the whole process stability and the troughput rates.

We help you upscaling your battery cell production – while our solutions are focussed on simple design, that is easy to maintain and clean.

Feeders are critical parts of the production system and require tightness consideration throughout their life cycles. Qlar provides sustainable feeding solutions that are build around reliable containment concepts to control the spread of harmful substances or materials and enable cleaning cycles with minimal to none human interaction.

With Qlar safe and economical processes in your battery manufacturing become gigaplant-ready!

Safe weighing and dosing **according to ATEX**

The ATEX Directive (ATEX = Atmospère Explosible) lays down standardized, applicable regulations for devices and protective systems intended for use in potentially explosive atmospheres areas. Its aim is to ensure that products fulfil certain requirements, to ensure a high level of protection of the health and safety of persons and goods is guaranteed.

Qlar solutions are the safest and best choice for a production chain in potentially explosive environments. They comply with the latest ATEX directives. The components used are ATEX-certified, are carefully documented and regularly inspected.

Among other things, the following highly flammable materials can be safely processed in accordance with the ATEX directives with Qlar Equipment:

- **Graphite**
- **Carboxymethylcellulose (CMC)**
- **Hydroxypropylmethylcellulose (HPMC)**
- **Xanthan**

Safe to high-performance battery cells **with OEB**

The OEB value (Occupational Exposure Band) indicates the toxic hazard potential that the raw material has. The higher the value, the more toxic the material. Alternatively, the hazard class can also be specified using the OEL value (Occupational Exposure Limit). This describes the average exposure of the personnel to the toxic raw material in an 8-hour shift. For raw materials of OEB levels 1 and 2, open or semi-open processing plants are permitted.
The systems in battery cell production, where toxic bulk materials are processed, generally fulfil OEB level 4.

Qlar offers for LIW Feeder CS+ the highest possible OEB class (up to level 4) and attaches particular importance to containment in importance to containment in battery cell production. Among other things, our developers must the requirements of different process types, obligatory interruptions of the batch as well as and options for cleaning and reassembling components components – so that the systems fulfil the meet the highest safety requirements.

We offer a safe solution for every material, even at high flow rates:

- **Lithium hydroxide**
- **Lithium carbonate**
- **Manganese sulphate**
- **Nickel sulphate**
- **Cobalt sulphate**
- **NMC**

Qlar solutions provide

- **Guaranteed tightness of our products**
  To limit the spread of harmful substances, we guarantee the tightness of our products. Our solutions are dust-tight and fit seamlessly into processes. The machine structure is kept simple. We offer special seals, triclamp connections, special jet filters that can withstand higher environmental influences than required, etc.

- **Optional PTFE or ceramic coating**
  In order to completely eliminate metallic abrasion, a coating might be mandatory. Static parts such as the trough and the discharge can be coated with PTFE at points where the product comes into contact. A ceramic coating is possible for rotating parts (agitator and screw).

Customized solutions **for your battery cell production**

There are various methods for producing cathode and anode mixtures to manufacture batteries. The most common method is batch dosing into a mixer. This can be done dry or wet and may vary depending on the type of mixer used. Additionally, there is continuous extrusion.

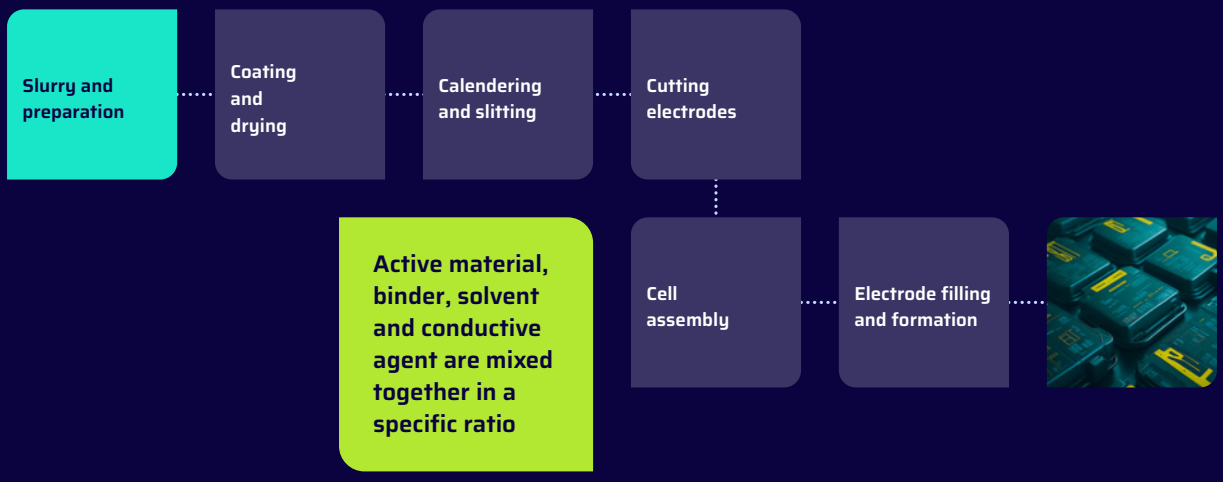
Each variation brings its own specifics and requirements to the equipment used to ensure the production of high-quality electrode paste. In both methods, highly accurate dosing is necessary to introduce the materials into the mixer and subsequent processes in the correct proportions.

To ensure high precision, a control system with CONiQ® Control has been developed specifically for these applications.

Let's take a closer look at the **three examples** and delve deeper into the solutions that Qlar can offer you for each of the application examples:

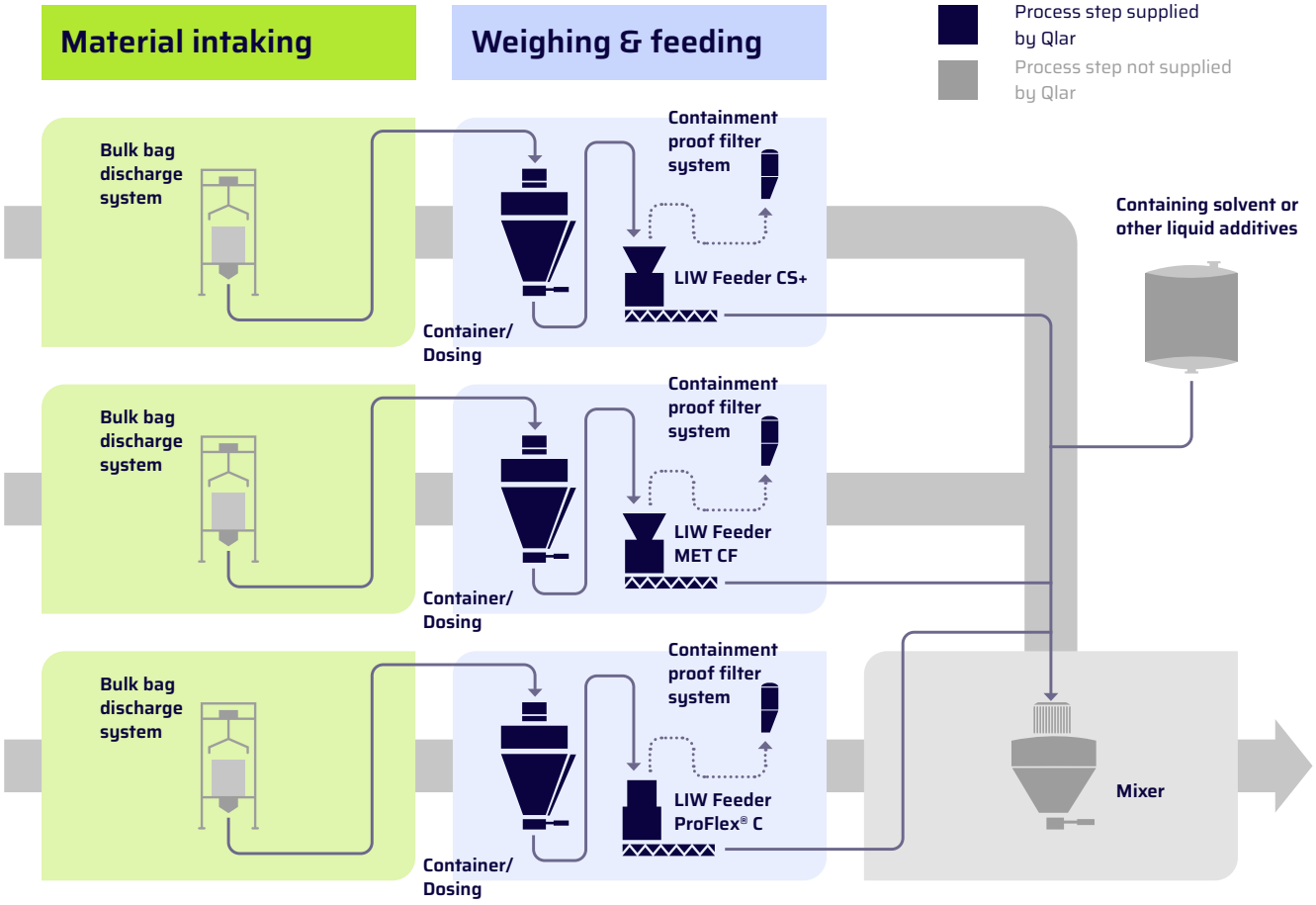
Example 1 – Batching process with planetary mixer
Example 2 – Batching process with Inline Disperser
Example 3 – (Semi-) Continuous dosing with extruder

Process chain **Handling and preparing raw materials and electrode slurry**



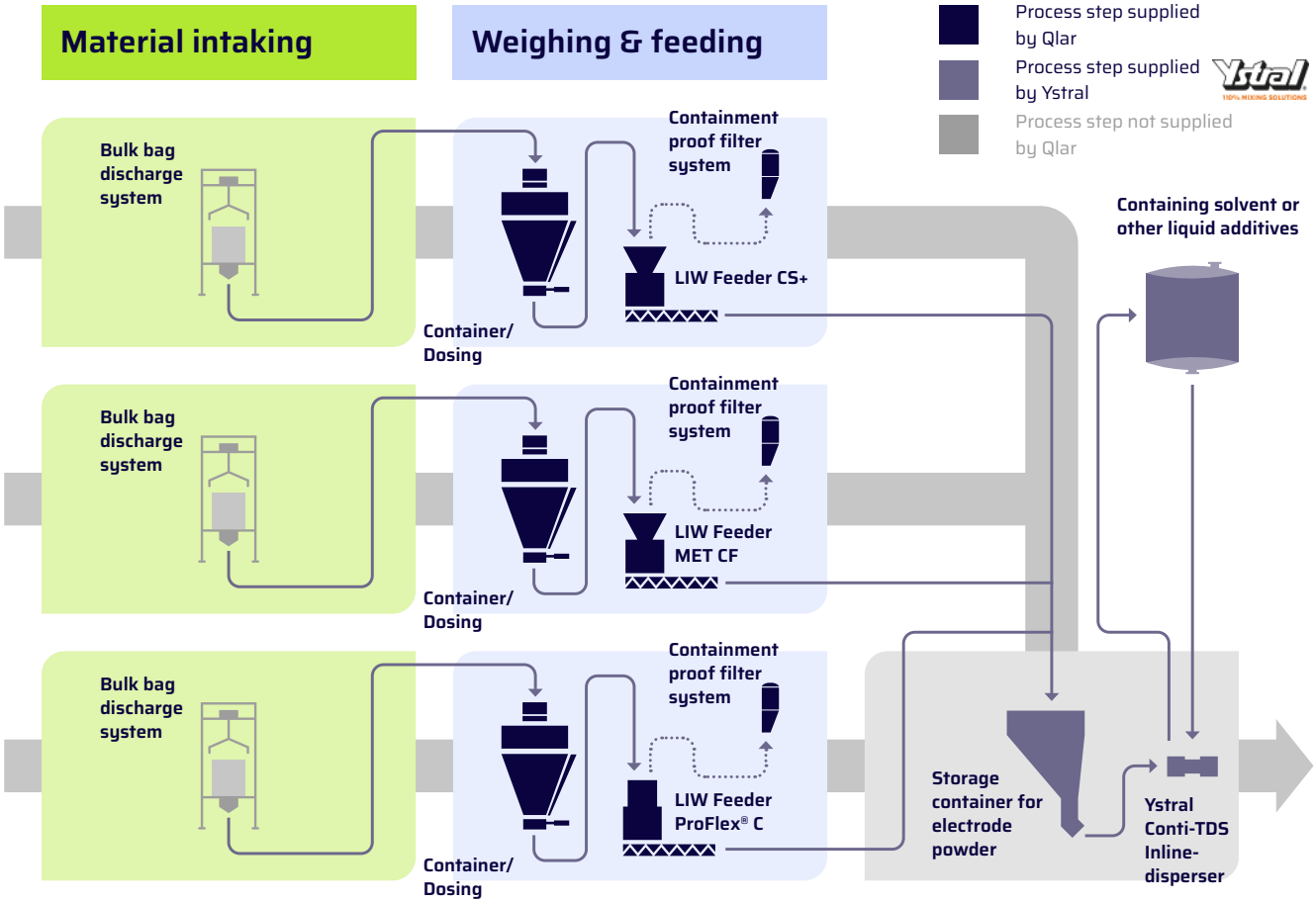
1 Example 1
Batching process with planet mixer

- Clear and flexible interfaces to material handling and downstream equipment (hopper, mixer, reactor etc.)
- The LIW concept makes simultaneous dosing possible. This shortens batch times and speeds up production.
- A specially developed filling concept is used to increase the dosing accuracy. A newly patented solution is used. A combination of a fast closing flap and a screwend bearing. This prevents material from trickling out while preventing the screw from coming into contact with the discharge.
- Filter concept and pressure compensation available



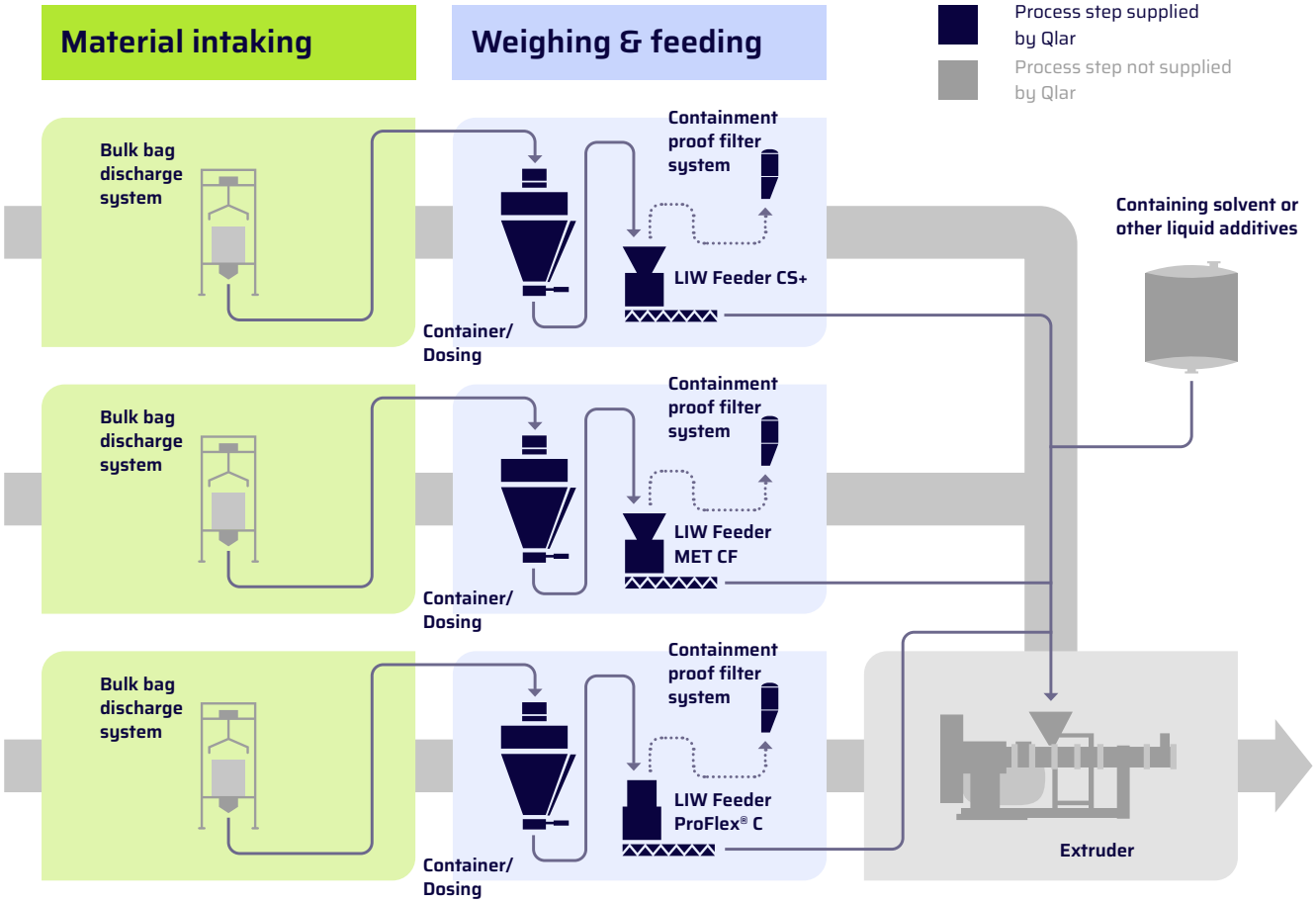
2 Example 2
Batching process with Inline-Disperser Conti-TDS by Ystral

- The cathode material powder is fed into a storage container using differential dosing scales. Under nitrogen blanketing, the individual materials are replenished from the refill containers. They are then simultaneously dosed into the holding container via a screw. The Inline Disperser subsequently draws the powder from this holding container and mixes it with the liquid pre-set in the tank.
- This solution allows for extremely short mixing times in a very compact space.
- Ystral GmbH's Conti-TDS, in combination with LIW Feeder CS+ and LIW Feeder MET CS provides an excellent solution for supplying your production with electrode slurry.



3 Example 3
Continous & semi-continous dosing with extruder

- Significantly higher throughputs, as production can be continuous. After just a short time, the correct ratio of raw materials is achieved and a very high quality slurry can be produced. Batch traceability is no longer a problem thanks to new inline quality control methods.
- Qlar has a lot of experience resulting from many years of joined effort with with extruder manufacturers in other industries.
- Continuous extrusion often proves to be more cost-effective in the long run. While the initial setup costs may be higher compared to batch mixing systems, the improved quality, efficiency, and productivity can lead to lower production costs per unit of battery slurry. Additionally, the reduced need for manual intervention and maintenance can result in long-term savings on labor and operational expenses.



Our product ranges for batteries

LIW Feeder CS+

The LIW Feeder CS+ system is specially adapted to the requirements of electrode production and is suitable for both continuous and batch processes for the production of battery mass.

- Feeding range from 30 to 3,000 liters per hour
- Excellent dust tightness up to OEB level 4
- Safe handling and cleaning
- Risk minimization for users in production
- No product contamination due to metallic abrasion
- Flexibility due to modular design
- Seamless integration into plant concepts with continuous containment concept to limit dust emission
- Compact, asymmetrical design enables a space-optimized arrangement in confined spaces

LIW Feeder MET CF

- Modular feeding system for all applications
- Quick and easy disassembly for cleaning and product changeovers via access from the non-process side
- External agitation for gentle handling of the mass flow in hopper
- Mass flow supporting new shape of the Coni-Flex feed hopper protected by patent
- Flexible trough in 5 different materials (also FDA approved)
- Paddle movement optimized for reduced disturbances on weighing modules in gravimetric mode

ProFlex®

- Optimal use of space through vertical, rectangular containers
- Close arrangement of discharge pipes due to asymmetrical positioning
- Low-pulsation discharge due to angled cut
- Low mechanical interference due to balanced agitation geometry
- Wide range of discharge elements and gear ratios for optimal adaptation to the product and required conveying capacities
- Compact, asymmetrical design allows for space-optimized placement in confined spaces

LIW Feeder MET CS

- Internal agitation (vertical agitator) with low wall adhesion for optimal bulk material mobilization throughout the dosing container
- Low bottom adhesion for uniform filling behavior in the screw/spiral intake area
- The divisible agitator (between dosing container and attachment container) for easy disassembly of the dosing container for cleaning/maintenance is patent protected
- Principle-based low disturbance forces on the weighing technology in gravimetric operation

Spares and components
for long-life performance

For all our core systems, we offer chemicals and performance materials processors readily available spare parts and components for long-life performance.

Our tailor-made, reliable solutions are backed by a global service network to ensure quick response times for service requests and short spare part delivery times.

Our service contracts are designed to meet your exact needs in the most cost-effective way, with original spare parts, timely upgrades and extended warranties.

Examples include

- Refurbishment and third-party spare parts
- Wear & tear parts such as screws, bearings, sealings
- Critical spares such as load cells

We partner with you **to keep your plant productive, profitable and safe**

Service
for your complete peace of mind

We design everything with long-term stability and maximum operational reliability in mind.

Whether we're doing a simple engineering study or a complete design-build project, at Qlar, everything we do is centered on customer satisfaction.

When it comes to your mission-critical processes, you need a partner you can rely on 100 % to keep your business operating optimally. At Qlar, we support our customers with fully tailored service concepts to guarantee complete peace of mind.

Our services, your advantages

- Industry experts with decades of experience
- Global test and innovation centers for feeding, weighing and conveying
- Dedicated application support
- Product engineering design
- Global manufacturing & engineering
- Installation and commissioning
- Global product & operation training
- Remote, digital support services for testing and aftersales

Frederik Hanss
Head of Chemicals & Performance Materials EMEA

Telephone: +49 173 639 89 15
Email: f.hanss@schenckprocess.com

Tim Wunderle
Customer Success Manager

Telephone: +49 6151 1531 3773
Email: t.wunderle@schenckprocess.com

Still questions? Contact us:
www.qlar.com/contact

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All specifications are subject to change.

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Schenck Process Europe GmbH
Pallaswiesenstraße 100
64293 Darmstadt, Germany
T: +49 61 51-15 31 0
F: +49 61 51-15 31 66
sales-eu@schenckprocess.com
www.schenckprocess.com