



Figure 1: Lithium-ion batteries are used in mobile devices such as smartphones, tablets, or laptops

A usual lithium-ion cell consists of an anode, a cathode, a separator, and the electrolyte. These cells are arranged within a packaging. The tightness of these enclosures is highly important as the electrolyte can strongly react with humidity. For this reason, the batteries are leak tested before they are filled with electrolyte (cylindrical and prismatic cells are welded). To ensure an exact and high-quality leak detection process, helium leak detection with its high sensitivity and repeatable results is predestined for this application (see Figure 2).

Pfeiffer Vacuum leak detectors for tightness tests of batteries

With 50 years of experience in leak detection, Pfeiffer Vacuum's broad product portfolio holds the optimal leak detectors for testing the tightness of lithium-ion batteries. Dedicated solutions are available for either research laboratories and prototype manufacturing or the industrial production of batteries. Latter often require fast, automatic leak detection. Modular leak detectors, which can easily be integrated in automated systems, are optimal for this process while research institutes might prefer versatile multipurpose devices.

Solutions for generating vacuum in the battery production process

Vacuum is also needed in other steps of the battery manufacturing process (see Figure 2): As humidity inside the battery must be prevented, it has to be taken care that the components are dry before they are assembled. This also applies to the electrodes which are produced as foil material and wound up. The coils are dried under vacuum. In order to achieve a low level of residual moisture, the pressure is reduced to a level below $1 \cdot 10^{-1}$ hPa while heat is constantly supplied to the coils. When filling the cell with electrolyte, vacuum is crucial as well. It prevents the moisture from entering into the cell and helps to avoid undesirable gas inclusions within it.

Pfeiffer Vacuum offers the matching pumps for each of these production steps: Dry compressing pumps using multi-stage Roots (A4H series) or screw (HeptaDry) technology. The latter can easily be combined with OktaLine Roots pumps in order to achieve high pumping speed. Without these elaborated vacuum solutions, the high-quality and lasting energy storage with lithium-ion batteries and thus the function of mobile electric devices would not be possible.

Are you looking for an optimal vacuum solution?
Please contact us!

Electrode production

Electrode drying

- Dry compressing pumps to keep your process clean.
- Rugged design with high water vapour capacity.
- High and stable performance to support a constant drying process at a low pressure.



A4H
Multi-stage Roots pumps

Mixing of slurries

Coating

Drying

Calendering

Slitting

Vacuum drying

Cell assembly

Leak integrity test

- Flexible modular designed leak detector of the latest generation.
- Easy to integrate in leak detection systems due to configurable interfaces.
- High Helium pumping speed to allow fast response time.



ASI 35
Leak detector

Separation of sheets from coil

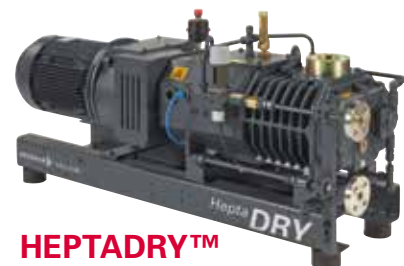
Stacking / winding

Joining and packing

Electrolyte filling

Electrolyte filling

- Dry compressing pumps to keep your process clean.
- High pumping speed at the complete pressure range to keep process time at a minimum.
- Low final pressure to reduce the amount of residual gas.



HEPTADRY™
Dry screw pumps

Figure 2: Pfeiffer Vacuum provides the optimal vacuum solutions for the production processes of lithium-ion batteries.

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Pfeiffer Vacuum stands for innovative and custom vacuum solutions worldwide, technological perfection, competent advice and reliable service.

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