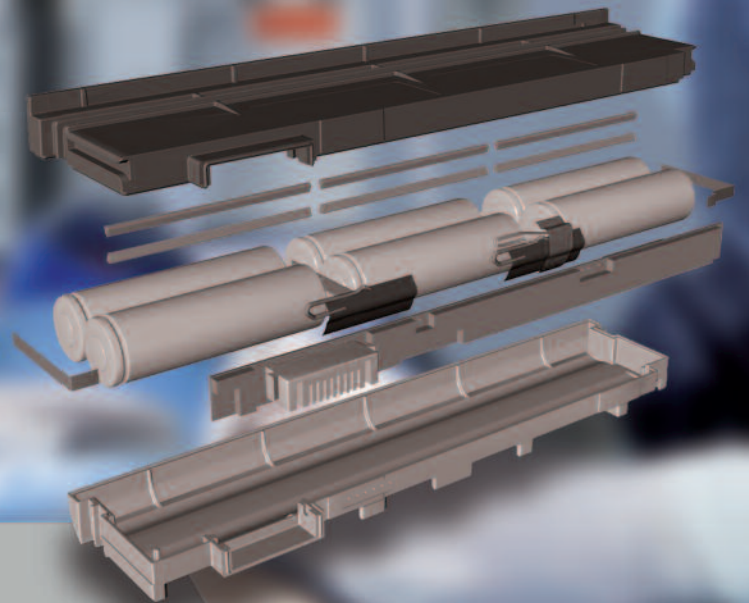


# Lithium power pack solutions for medical devices



Power Pack Solutions

# Portable power you can depend on

Lithium-ion has emerged as the preferred battery chemistry for portable electronic devices. Compared to older cell chemistries such as Lead Acid, Ni-Cd and Ni-MH, lithium cells offer greater energy capacity in a smaller and lighter package.

Here is how VARTA Microbattery meets the requirement of medical OEMs for quality, reliability and performance in custom lithium power packs.

## ■ Advanced technology for high performance

VARTA integrates the most sophisticated control and monitoring electronics into its battery packs. This provides benefits such as longer run-times, highly accurate state-of-charge indication and extended battery lifetime.

## ■ Expert implementation of lithium cells

VARTA Microbattery can provide proven lithium battery technology for medical products. Our custom power packs, provided through our CellPac PLUS design and manufacturing service, include advanced control and protection technology to ensure that the battery pack is 100% safe and reliable. VARTA's lithium expertise ensures you get a battery pack that offers both high performance and safe operation.

## ■ Managing projects to budget and schedule

VARTA Microbattery's custom engineering service, CellPac PLUS, is run by experienced project managers. Working to optimise your specification from the beginning of your design, the VARTA team ensures your custom rechargeable battery pack is designed to fit the precise overall requirements of your product.



## ■ Manufacturing to world-class standards

Custom lithium battery packs for medical devices are produced at VARTA Microbattery's manufacturing facilities. VARTA's manufacturing processes have been approved by regulatory agencies including the US Food and Drug Administration.

## ■ Implementing approvals processes on your behalf

Gaining relevant approvals and certifications can be complex and time-consuming. VARTA's CellPac PLUS service takes care of all testing and approvals related to the power pack, so that you don't have to.



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## CellPac PLUS: a complete battery design and manufacturing service from lithium battery experts

CellPac PLUS is the name of the Power Pack Solutions service from VARTA Microbattery. CellPac PLUS offers an end-to-end battery design solution, from the initial specification through to pack production.

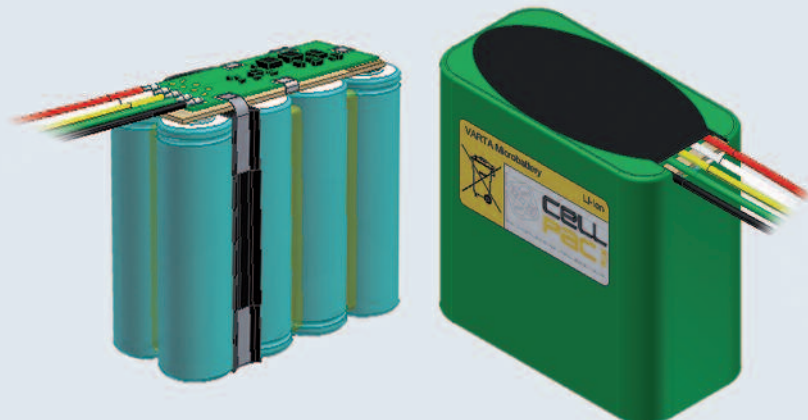
Working with the CellPac PLUS team will give you access to a dedicated group of technicians and project managers, each experienced with every aspect of battery design, construction, certification and implementation to ease the time-consuming process of developing a battery for a medical device. It is VARTA's responsibility to deliver the best battery for your product on-time and on-budget, enabling you to achieve faster time to market and optimal device performance.

### Supporting medical equipment OEMs

- Successful battery approval from US Food and Drug Administration (FDA)
- Lithium-ion power packs manufactured by VARTA Microbattery have gained the following approvals and certifications: IEC62133, UL2054, UL1642, UN38.3. VARTA Microbattery power packs in production today support customers' EN-60601 qualifications.
- VARTA Microbattery packs power medical devices from Class I and Class II, including:
  - monitors
  - infusion pumps
  - DVT pumps
  - respirators
  - oximeters
  - ECG monitors
  - blood pressure meters
  - portable lights
  - recorders
  - suction units

### VARTA Microbattery: Europe's largest manufacturer of batteries

- Global headquarters in Ellwangen, Germany
- Europe's largest manufacturer of primary and rechargeable cells
- The world's leading producer of hearing aid batteries
- Developing new lithium-ion technology for next-generation electric vehicles through a joint venture with Volkswagen



# Battery pack design considerations for medical applications



## Cell chemistry

VARTA Microbattery packs use the highest-quality lithium cells. Offering superior energy density and more charge-discharge cycles, these cells enable VARTA battery packs to run for longer between charges and to require less frequent replacement, reducing the cost of ownership.



## Safety and protection

Lithium-ion batteries are completely safe to use in hospitals and surgeries when designed with relevant protections from excessive voltage and heat. VARTA Microbattery packs all come with integrated protection circuitry which monitors voltage and temperature, and automatically controls the supply of power from the battery to keep these parameters within safe limits.



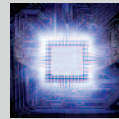
## Authentication

Medical staff and patients can be confident that only batteries approved for use by the original equipment manufacturer will operate in the device. VARTA Microbattery battery packs supplied with sophisticated cryptographic technology require the host device to authenticate the battery each time it powers up.



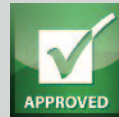
## Fuel-gauging

When the patient's care depends on a medical device, it is essential to know how long the battery will operate before it requires recharging. VARTA Microbattery implements the world's most accurate fuel-gauging technology to give patients and medical practitioners confidence that they will not suffer an unexpected power-down event.



## Electronics circuit design

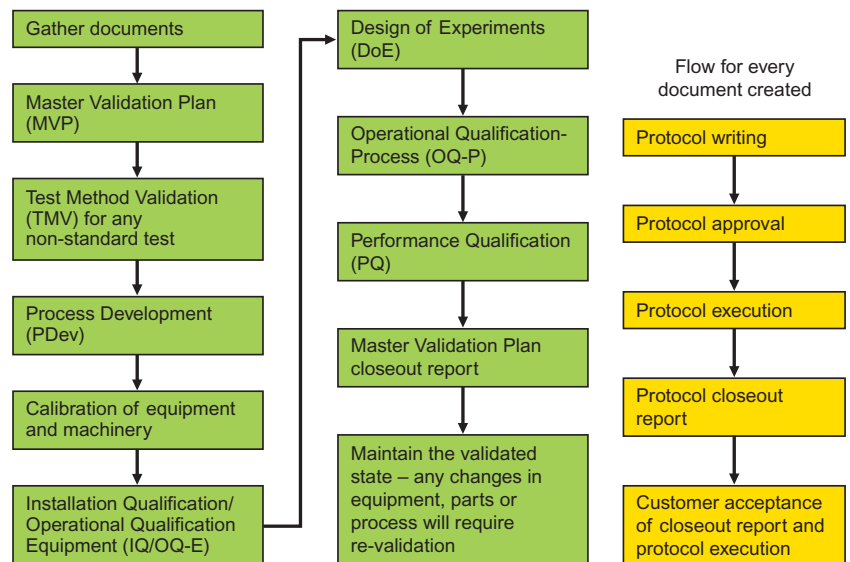
Factors such as peak current requirement, minimum voltage threshold and the charging profile have an important effect on the lifetime (number of charge/discharge cycles) of a battery pack. By working with you from the outset of your design project, VARTA Microbattery can advise on specifications that will maximise the operating life of the pack.



## Approvals and certification

The medical equipment industry is very tightly regulated. VARTA Microbattery designs its custom lithium-ion packs and production processes from the beginning of every project to meet the requirements of every certification the customer specifies. VARTA pilots its battery packs through the approvals process, to take this significant burden from its customers.

## FDA Validation Process Flow



## The world-class technology inside a custom VARTA power pack

Custom power packs from VARTA Microbattery contain the latest control and monitoring technology. Thanks to the features embedded in these batteries, users of medical devices can run their devices more safely, for longer, with more confidence in their power supply.

### Extremely accurate fuel-gauging

- Fuel-gauging implemented in inferior batteries is based on crude voltage sensing. Readings are distorted by temperature swings and by the ageing of the battery.
- VARTA Microbattery's power packs use the most advanced Impedance Tracking™ technology, which provides accuracy of better than 1% across the discharge cycle and across the operating temperature range, for the life of the battery.

### Multiple levels of protection

VARTA Microbattery power packs provide three levels of protection in the electronic control circuitry.

- At the first level, safety circuits built into the pack constantly monitor voltage, current and temperature, and the pack's controller software triggers safety procedures when specified thresholds are passed.
- At the second level switches shut off the power supply to the device to prevent any risk of combustion or other hazard in prolonged over-voltage, over-current, under-voltage or short circuit conditions.
- At the third level, a fuse trips in the event of short circuits or other extreme electrical malfunctions.

### Active cell balancing

- In normal operation, small variations in voltage arise between one cell and another. This can lead to inefficiency in both charging and discharging.



- VARTA Microbattery implements the most advanced active cell balancing technique, restricting the difference between any two cells to less than 20mV. This maximises the energy capacity of the pack as a whole, and extends the battery's useful life.

### Precisely engineered housings

- Portable medical equipment might be subject to contamination, shock, vibration or immersion in liquid.
- Metal or plastic housings in VARTA Microbattery packs are made of high-quality materials and precisely engineered to fit each customer's requirement.
- Rigorous design and testing procedures, approved by the US Food and Drug Administration, are used to characterise the durability of custom battery pack designs.



## Praise for VARTA Microbattery from a leading medical device manufacturer

*“VARTA Microbattery maintained excellent communication with my project team throughout the development of the power pack, which has delivered excellent performance in terms of run-time and reliability. VARTA showed a good understanding of our requirements as a medical device manufacturer.”*

Embedded Systems Manager, Fresenius Kabi – Infusion Systems

# Request a free consultation with a VARTA Microbattery design expert.

Contact your regional VARTA Microbattery sales office and ask for the Power Pack Solutions team.

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