 mobile synergie

BE·POWER

Battery and Energy Modules



BE POWERED



▲ electric racing bike
Team Münch Racing

Flexibility and innovation

BE-Power GmbH, headquartered in Fernwald near Giessen, Germany, is an innovative company that has developed, produced and distributed high-quality and market-oriented quality products since its inception in 2004.

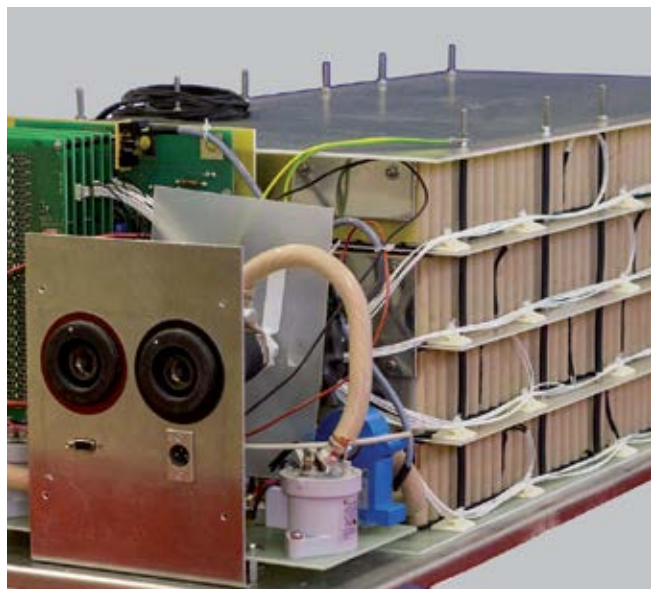
Innovation, market-oriented planning, keeping an eye on the market and cooperation with manufacturers of state of the art battery components will continue to guarantee that customer requirements are met according to the principle of flexibility, quality and progress. This gives the customer the certainty of being able to obtain a product that is practical and producible and which is designed according to the respective current state of the art and, if so desired, custom designed.

The company is just as active in complex, industrial applications, which are used, for example, in „Industry 4.0“, as in storage solutions for the temporary storage of electrical energy or in connection with electromobility. In this respect, BE-POWER GmbH thinks beyond and makes electric mobility possible on the water and in the air. BE-POWER GmbH also offers a wide range of solutions in the field of personal lifestyle, which is increasingly penetrated by mobile and independent electrical applications. The desire to be one of the leading companies for quality-conscious power supplies of all kinds is the claim and commitment of all employees.

Our core competencies

- ✓ technology driven
- ✓ high-end solutions
- ✓ BMS design
- ✓ battery design
- ✓ customer proximity
- ✓ R&D

high-performance battery ►
for electric speedboats





solutions for all ▲
dimensions ►



Future-oriented technologies

The importance of power grid independent and mobile energy sources as well as the number of applications that can be equipped with, is constantly increasing. New applications often require new performance data. Hence, new applications require new technologies. Through a comprehensive and variable product range, BE-POWER meets this development.

By using most modern and future oriented chemical battery technologies

- e.g. of lithium nano titanate accumulators

in a variety of cell types and electrical performance, which can partly be obtained through BE-POWER only

- e.g. „THD (Through-Hole Device)“ designs.

BE-POWER offers solutions for different applications in a wide range of performance classes as

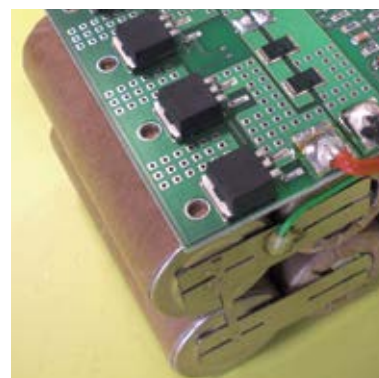
- one to several hundred volts
- some mA h to several thousand Ah
- mWh to MWh.

The topic of fuel cells, which is increasingly important for electromobility in the future, is also being addressed by BE-POWER in the course of product developments. BE-POWER is constantly working on the latest technologies and developments, e.g.

- Lithium-air accumulators
- Lithium-sulfur accumulators

and considers current market trends, through active cooperation in the ZVEI and its related committees.

In regards to modern and powerful solutions, this gives the customer the certainty of having a competent partner at their side.



New technologies

- ✓ lithium-air
- ✓ lithium-sulfur
- ✓ lithium-rich
- ✓ silicon-nano-wire
- ✓ fuel cell



◀ lithium-titanate traction battery

Innovative, rechargeable lithium-ion solutions

All chemical variations within the family belong to the product range of BE-POWER and are specifically used according to the requirements.

In addition to the optimal design of the battery-pack according to customer requirements and purpose of use, the safety of the product, considering any conceivable operation condition, in any circumstance is a main feature during the product development.

The safe use of Li-ion technology requires an complete electronic monitoring of the battery cells using a BMS (Battery-Management System) in all cases.

Another core competence of the company BE-POWER is the in-house development of such BMS electronics by a team of trained electronic engineers. Taking into account the new IC developments of various, well-known chip manufacturers, an always optimal application solution is developed, which is designed to meet customer requirements.

Specific design, development and implementation of the BMS as well as its reproducible production is carried out and monitored by BE-POWER.

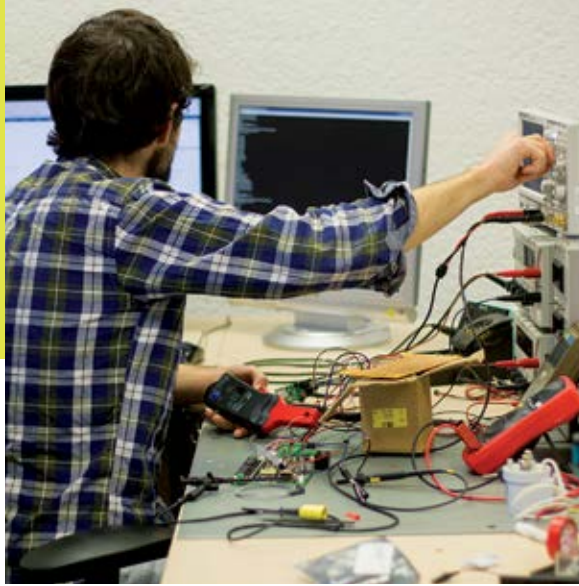
Based on the modification of an existing platform, it is ensured that customer-specific developments can be carried out within a short and cost-saving time frame.

Properties of lithium-ion accumulators

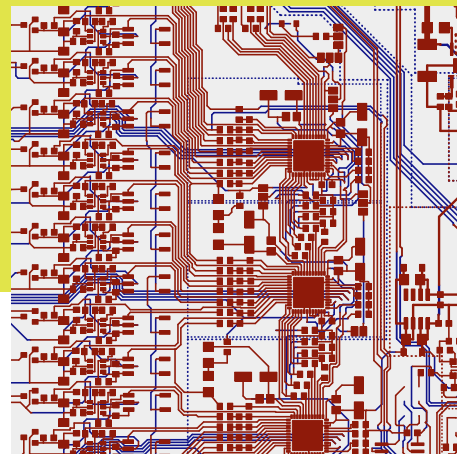
- ✓ high voltage level
- ✓ high energy density
- ✓ low volume
- ✓ low weight
- ✓ economic lifetime
- ✓ heavy current ability (depending on technology)

product diversity ▶





▲ BMS software development



▲ modular BMS-layout

Battery-Management-System (BMS), hardware and software development

On request, the BMS provides the user with a variety of individual data, which he can use to evaluate and use his devices. Thus, in addition to a purely visualised capacity display, it is possible to access RS-485 or CAN-based communication. The readout is made by using the BEbatt-Master software developed by BE-POWER.

The safe and reliable operation is ensured not only by an optimal design of the rechargeable battery. The charging technology adapted to the application and technology is also a decisive factor. BE-POWER is a competent partner for this topic, as well as for questions concerning the right charging process, such as inductive charging.

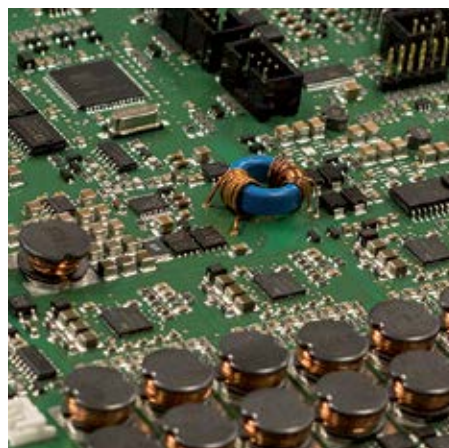
The service spectrum of the company BE-POWER GmbH is completed by:

- Comprehensive System-solutions, including e. g. casing, design and safety issues.
- Consultation and implementation on all transport and dangerous goods issues (UN38.3, UN3480, UN3481) and Battery Safety (IEC62133 and UL2054).
- Consulting in questions regarding batteries, Accumulators and Power Supplies.

Hence, the company BE-POWER GmbH offers a complete one hand solution!



BMS hardware ►



BMS	
✓	safety
✓	communication
✓	SoC
✓	balancing
✓	data logging



▲ electric speedboat



Individual solutions

represent a particular strength of BE-POWER. Our richness in ideas and our strength in development results in our claim to offer solutions in respect to customer's requirements for voltage and capacity, even if the request is close to the technical limits.

Access to a global supplier network results in unusual, unique and individual battery solutions and ideas with exceptional performance requirements through the customer are additional strengths of BE-POWER GmbH.

Market segments

- ✓ **medical application**
- ✓ **logistics**
- ✓ **electric mobility**
- ✓ **lifestyle and leisure time**
- ✓ **ESS**

Product diversity

Electromobility

Electromobility is primarily understood as mobility on the road. In addition to activities in this area, BE-POWER has set itself the task of expanding electric mobility to the elements water and air.

In various projects, BE-Power designs battery systems for boats as well as battery systems for electric sailplanes. The latter one has been developed in the context of a government funded R & D project.

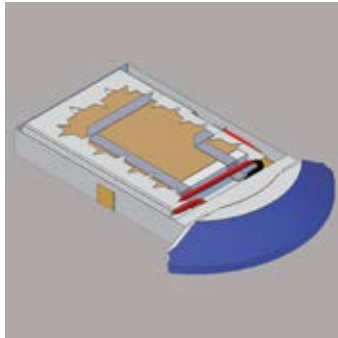
The weight, volume and safety of the battery systems, in addition to the high power requirements of the battery present a particular challenge in such applications. For electric boats, voltages up to 600V or capacities up to several hundred Ah and performance up to 150kW were realised.

For the use in electric gliders, however, smaller battery packs with 400V and 30Ah were used for weight reasons with a power of 25kW.

In the case of rechargeable batteries for electric boats, lithium-ion technologies are used, which provide high power and sufficient range at the lowest possible weight.

Identical requirements are met for applications in the air, whereby the weight of the battery plays an even more important role.

cardiotocograph battery ►



▲ operating table

Medical applications

Well-known companies in this field trust the products developed for them by BE-Power.

Detailed test procedures and examinations as well as the certified production and quality assurance of BE-POWER guarantee reliability, safety and longevity.

During product development customer requirements and desires are taken into account and implemented in a joint development. Hence, the customer can follow up and influence the development status, leading to a satisfying product. Traceability and documentation are just as self-evident as accompanying the product to the final market launch.

The product range of BE-POWER GmbH offers a wide range of opportunities. Starting from solutions for applications needing a few volts and a few mAh only and particularly small designs.

Unique miniaturised cell designs allow developers an entirely new approach to new ideas.

Special products

BE-POWER GmbH is the first point of contact when it comes to finding solutions for powering unusual applications.

For example, already solutions for a-magnetic batteries for the mine search were developed or battery packs for tsunami early warning systems, which perform their service in more than 6000m below sea level.



▲ tsunami warning system for a depth of more than 6000 meters

Market segments

- ✓ power tools, garden tools
- ✓ high-end industrial applications
- ✓ kart racing
- ✓ outdoor, caravanning, light
- ✓ micro battery applications

Automated Guided Vehicles at work ►
in a clinic underfloor



Product diversity

Logistics

Intra-logistics has been equipped with lead-acid accumulator AGVs for many years; both in the use of manned FTS (Floor Transport System) and self-propelled, unmanned AGV (Automated Guided Vehicle). A change to lithium-ion technologies offers the manufacturers of such AGV clear advantages:

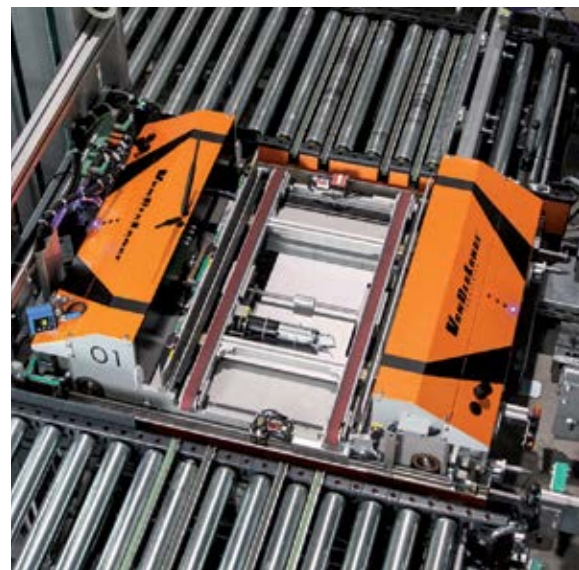
- maintenance free
- elimination of expensive battery exchange stations
- lower weight
- lower volume or higher usable capacity at the same volume
- more efficient use of energy
- Fast and intermediate charging results in around the clock productivity (24/7)
- Smaller vehicles with smaller driving radius
- higher life expectancy of the battery system

Not only in the area of intra-logistics, but also in the area of shipment of goods, such vehicles are becoming increasingly interesting in future. Reason for that is the possible miniaturization and the achievable wide range due to the Li-ion technology.

In the future, such AGV (Automated Guided Vehicles) will be used for direct shipping and delivery of end-customer orders.

AGVs are predestined for use within Industry 4.0 and defines interfaces within increasingly automated production.

storage and retrieval vehicle ►



Flexibility

- ✓ intralogistics
- ✓ storage and retrieval systemes
- ✓ AGV
- ✓ industry 4.0
- ✓ lithium-titanate



◀ Automated Guided Vehicles at work in the automobile industry

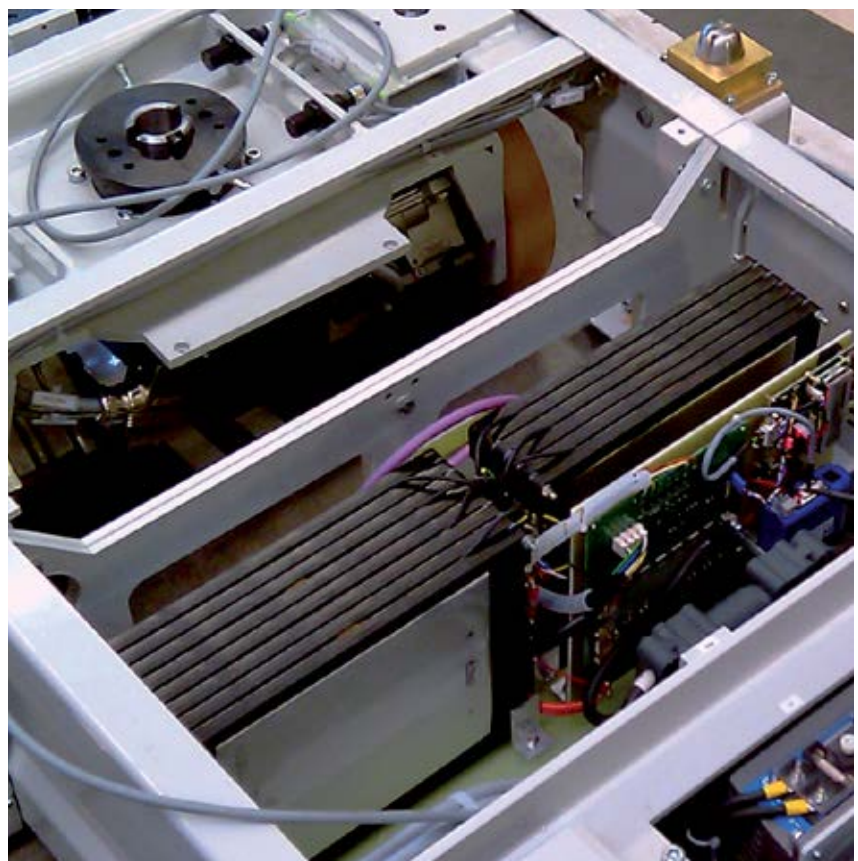
For this application, BE-Power offers intelligent solutions in the voltage ranges 24V, 48V, 80V or for special vehicles with a higher voltage supply. Possible capacities range from 20Ah up to >1000Ah. The accumulators are offered as well in the standard lead-acid battery housings as in special customer specific containment solutions, possible from lot size 1.

The selection of the appropriate lithium-ion technology is determined specifically based on the requirements.

BE-Power offers solutions for storage and retrieval systems (S/R) by equipping transportation shuttles with Li-ion batteries instead of supercaps.

The Li-Ion solution offered by BE-Power combines the required fast-charging capability (supercap) with the advantage of a higher energy yield, and therefore longer run time, of a rechargeable battery. This is made possible by the use of specially designed Li-Titanate accumulators in combination with smart electronics.

lithium-ion battery build in ▶ an Automated Guided Vehicle





◀ electric golf trolley and battery pack



▲ electric skateboard

Product diversity

Lifestyle

Today everyone experiences the increasing possibility of mobility in daily life.

Thus, more and more household devices, that formerly needed power cords are becoming a daily companion through modern battery technology; e.g. mobile phones, cordless screwdrivers, etc. However, there are also applications that could not be electrified due to previously missing, suitable battery technologies. Thanks to Li-Ion technology, this has changed fundamentally. Suddenly, electric lawn mowers drive round, golf trolleys roll independently or completely new leisure-time experiences can be achieved with E-bikes and E-Skateboards.

Mobile light illuminates events at any desired location, or power-cord relevant devices can be used anywhere, being electrified by using a mobile power case.

BE-POWER GmbH is familiar with all these applications and keeps its eyes constantly open to further electrify applications (e.g. electric wheelbarrow) or in creating ideas for further increase of mobility. Do you have an idea, let's talk about!



◀ electric paraglider



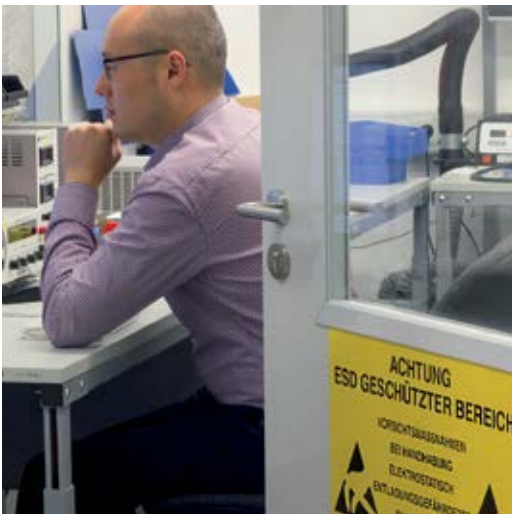
Groundbreaking quality and customer proximity

The BE-Power GmbH is certified according to ISO9001:2008. Customers benefit from individual, comprehensive consulting and intensive support. Extensive tests and documentation ensure the highest quality level and traceability.

Testing and examinations enable a fast and precise analysis, the results of which are incorporated into the production process. Core processes and support processes are constantly being improved. These iterative procedures subsist in all areas of the company and are part of the

strategy and philosophy of BE-POWER. Each employee is responsible for the quality in his / her department, and is thereby decisively involved in the success.

Customer satisfaction is the top priority!



◀ EFD test laboratory

corporate philosophy

- ✓ flexibility
- ✓ ISO 9001 certified
- ✓ reliability
- ✓ service
- ✓ know how
- ✓ analysis



▲ electric sailplane

Revolutionary visions

The BE in the BE-POWER GmbH logo stands for battery and energy modules. In addition to batteries and accumulators, the company also stands for sophisticated energy supply units in general.

Visions have to become concrete ideas - ideas demand an active implementation.

For example, the employees of BE-POWER are continually working on the design and realisation of system solutions for mobile power supplies; both in the realisation of extensive customer requirements as well as in the implementation of own product and technology ideas.

BE-POWER is therefore also involved in research projects funded by the federal government or the EU, e.g.

- Development of batteries for electric drives of aircraft
- „Second- Use“ applications for electric vehicle used batteries
- Power Supplies for exoskeleton

For this commitment, the company was awarded the Innovation Logo of the German Stifterverband.



overhead exoskeleton ►
in cooperation with
Fraunhofer IPA

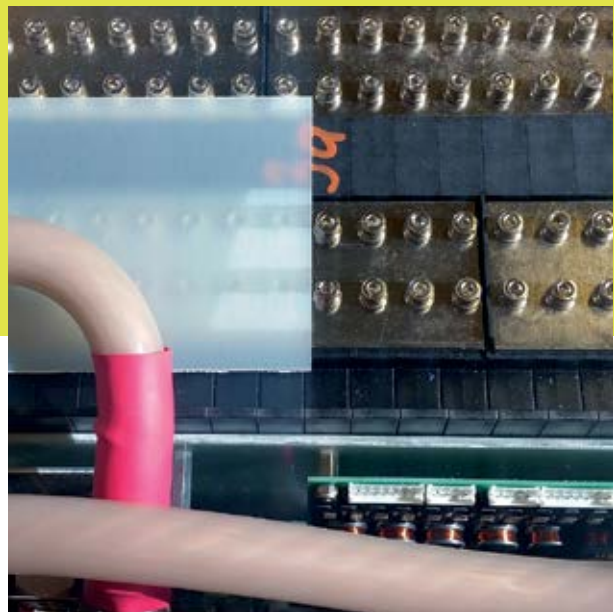
In order to guarantee a continuous product range to its customers, BE-POWER maintains close contacts and partnerships with established, technology-defining brand manufacturers and research facilities world-wide.

In addition to accumulators, fuel cells will become a useful power supply for mobile applications. Today, BE-POWER is your partner for questions about this future-oriented technology.

In this sense, we remain your BE-POWER team and wish you always:

BE POWERED



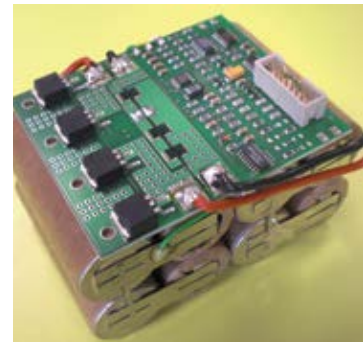


Some examples from the BE-POWER product range

Li-Ion | 7,4 V / 5,200mAh ▶

Lithium-ion charger ▶▶

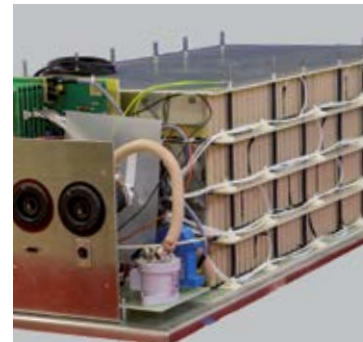
LiFePO₄ | 12,8 V / ▶▶▶
5.200 mAh for flash generator



◀◀ Ni-MH | 9,6 V / 200 mAh
block battery

◀ Three-phase on-board
charger for electric speed-
boat 300 V / 23 A / 7 kW

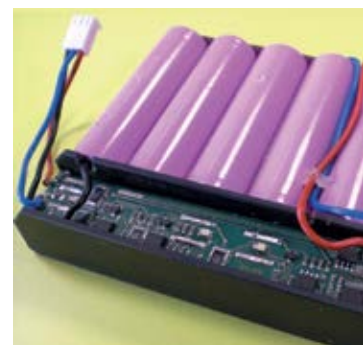
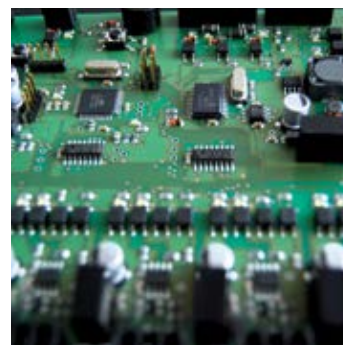
electric speedboat battery ▶
600 V / 150 kW



◀ Various OEM rechargeable
power packs

Electronic interconnection ▶
master box for parallel connec-
tion of up to 6 battery modules

Li-Ion | 11,1V / 5.200mAh ▶▶
for medical analysis instrument



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