



Energy supply for mobile or independent electronic applications 

Energy supply for mobile or independent electronic applications, with primary or secondary cells

Today's industrial landscape is characterized by ever increasing product requirements and need for mobility, which requires maximum flexibility and independence. In order to meet these requirements, new mechanisms and systems which allow for quasi-autonomous use of various electronic devices are always being developed. A key issue here is long-term largely self contained energy supply.

At the same time that several methods for harvesting energy are being discussed and tested, technology for battery-operated electronics applications is also being further refined and optimized. The best solutions for independent electronic systems can be found through the use of smaller and more compact batteries which utilize varied technologies. The combination of appropriate energy usage with sophisticated circuitry and high-efficiency voltage regulators perfects demanding electronics applications.

dataschalt has gathered extensive experience in the optimized use of batteries and accumulators (rechargeable batteries) in independent electronic systems. To give you an insight into the different ways of supplying energy, here is a presentation of some basic parameters, as well as some pros and cons.

The basic concept behind long-term independent electronics is to either continuously consume very little energy, possibly only a few milliamps, or to only use the existing energy in short intervals and to use a switch to put the device "to sleep" in the meantime in order to save energy. In this way, even systems with high current consumption can run on a battery long-term when the application period can be limited to short time intervals.



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"Secondary cells, which make it possible to supply energy for electronic devices long-term and are combinable with alternative charging options such as solar, will have a greater significance in industrial electronics in the future."

Applications for primary cells

For possible applications in which very compact design can be combined with low current consumption, even a (non-rechargeable) primary cell should be sufficient for a few months of use. Small models, for example 1/2 AA (\varnothing 14.5 mm x 25.4 mm), equipped with capacities up to 800mAh and a maximum current of 100mA, are already available. The industrial temperature requirements should not present any difficulty.

For requirements with higher amperage and higher capacities, primary cells in finely graded sizes are available and increase with the volume of energy.

Pros	Cons
<ul style="list-style-type: none"> · High-amperage and size variability · No restrictions in the area of industrial temperature requirements 	<ul style="list-style-type: none"> · Use of limited duration, battery change is necessary at regular intervals

Applications for secondary cells

In systems where recharging batteries with a regular energy source is possible, different battery models may be selected. As standard technologies, Nickel-metal hydride (NiMH) and lithium-ion batteries are available, for example.

If a system has relatively low requirements in terms of independence and energy density, i.e. the amount of energy per unit of weight, then use of NiMH battery cell technology is called for. The batteries are cheap and are even easy for the end user to change. The disadvantages are higher self discharge and lower energy density than lithium-ion technology.

The current standard technology with very high energy density is lithium-ion battery technology, which also offers rapid charge and low self-discharge. In addition, a lithium-ion battery is compatible with low or fluctuating load currents, for example for an independent system with only occasionally available energy sources. Charging can be accomplished with, among other things, kinetic or solar energy.

The applications of lithium-ion batteries are determined by the adjustable charge voltage and the maximum charge current as a function of temperature.

By reducing the charging end voltage the total potential capacity of the battery is somewhat diminished, but at the same time the lifetime is significantly prolonged, which can have a positive effect for long term applications with low load currents.

The temperature at which a lithium-ion battery can be charged is set by the manufacturer to a specific range and is automatically only allowed to charge within this area through the charging electronics. The permissible temperature of the battery discharge of between -20°C and $+60^{\circ}\text{C}$ is sufficient for many industrial requirements.

For use under extreme conditions, various battery manufacturers are now developing or introducing to the market lithium-ion technology with extended temperature ranges, increased longevity and faster charge.

	Pros	Cons
NiMH batteries	<ul style="list-style-type: none">· low cost· Easy to use / exchange	<ul style="list-style-type: none">· Higher self-discharge· Lower energy density
Lithium-Ion batteries	<ul style="list-style-type: none">· Fast charge, even with fluctuating flows· Low self-discharge	<ul style="list-style-type: none">· Higher cost

Because of the dataschalt team's experience in the use of primary and secondary batteries which can, for example, be recharged by solar units, we can advise you extensively in making energy choices for your applications. To meet your needs, we're happy to research current battery technology and complement it with our electronics to optimize your applications and devices.

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