The RoadPro Guide to Lithium Batteries for Motorhomes, Campervans, Caravans, Specialist Vehicles and Boats.

- ***What they do,***
- ***How they work,***
- ***What you'll need,***
- ***And, why a lithium battery in your vehicle can change the way you use it forever!!***

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Lithium Batteries: The Basics

Lithium batteries were invented and developed in the 1970s and 80s and have totally changed the way we use many electrical appliances. It's only recently though, that the advantages of lithium battery technology have begun to be available to motorhomers, caravanners, boaters and anyone who relies on 12V batteries for power.

The difference in performance between a lithium battery and a traditional lead-acid battery is so great that anyone who is serious about staying "off-grid" in their vehicle or boat really has to consider installing one. It can only be a matter of time before lead-acid batteries are consigned to the proverbial dustbin of history.

Let's get one thing clear to start off with: there are several different types of lithium battery and the ones that are used as auxiliary / leisure batteries are very different indeed from those used in electric cars, mobile phones and cordless electric tools. The ones we're talking about here are lithium iron phosphate (LiFePO4) batteries and here are some of their advantages over traditional lead-acid batteries:

- ***Voltage remains constant for much longer during discharge.***
- ***Much higher charging rate and so faster charging – varies according to the charging system used.***
- ***Can be discharged quickly without damaging the cells, making them ideal for use with inverters.***
- ***Can be discharged approximately 95% on average without damaging the battery.***
- ***Thousands of charging cycles compared to just a few hundred from a typical lead-acid battery.***
- ***Very low rate of self-discharge means they can be left unattended for months.***
- ***Zero maintenance required.***
- ***The shape of some models enables them to be installed in places where a lead-acid battery cannot.***
- ***Approximately 50% lighter than a lead-acid battery with a similar Ah rating.***
- ***Very safe in normal use with no toxic fumes or liquid and no risk of fire in normal use.***
- ***The ability to charge quickly from the vehicle's engine can remove the need for a generator or fuel cell.***
- ***Can be used in almost every situation where a lead-acid battery is being used.***

There is really only one disadvantage to having a lithium battery in your vehicle or boat and that's the initial cost. This is likely to be significantly more expensive than a lead-acid battery with a similar Ah rating. However, as a lithium battery can remove the need to ever use mains hook-up and can be charged and discharged several thousand times, for some people the purchase cost will be more than recovered during the battery's lifetime. In addition, if you normally use a generator or fuel cell to charge a battery or operate 230V appliances, a LiFePO4 battery means that you probably won't need either of these items. This saves money, inconvenience, excess weight and the necessity for additional fuel.

Let's look at the advantages of LiFePO4 batteries in more detail:

1) Voltage remains constant for much longer during discharge.

If you've ever been watching TV and the picture has suddenly vanished while the sound stays on, you've experienced one of the problems associated with lead-acid batteries. Even though the battery may only be discharged by 40-50%, the voltage can drop to a point where certain appliances won't function as they should.

LiFePO4 batteries maintain usable voltage throughout the discharge cycle, down to as low as 5% state of charge.

This VW Crafter has an EZA 130 power-pack which is used to run all the 12V & 230V appliances, including the heater. Rob & Sue have spent several years travelling in Asia, Europe and Africa, relying on the EZA for electrical power.

2) Much higher charging rate and so faster charging – within the limitations of the charging system used.

Lead-acid batteries don't respond well to being charged quickly. It can be done but, depending on the battery type, capacity and charging method, it can take many hours to fully charge one. Charging lead-acid batteries quickly can also damage them.

Because LiFePO4 batteries are able to accept a high rate of charge - over 100 Amps in some cases - they can be charged much more quickly. Even when it's almost fully discharged, a LiFePO4 battery can be safely charged up again much faster than a lead-acid battery. Just running the vehicle's engine for 20 minutes or so can put enough Amps into the battery for hours of use.

The charging rate is dependent on the vehicle's charging system and will vary according to how the charging system is performing.

3) Can be discharged quickly without damaging the cells, making them ideal for use with inverters.

Discharging lead-acid batteries quickly can be even worse for them than fast charging. It can cause the plates in the cells to deform and, if done frequently and at a high discharge rate, can dramatically shorten a battery's life.

LiFePO4 batteries respond well to fast discharging with no adverse effects. This makes them ideal for use with inverters, especially when the appliances to be powered draw a lot of current: coffee machines, microwave ovens, hair dryers and toasters for example: even induction hobs. This ability to reliably power 230V appliances without the need for mains hook-up is one of the main reasons that people install lithium batteries.

4) Can be discharged to as much as 90-95% without damaging the battery.*

When a lead-acid battery gets to around 50% state of charge, the voltage will usually have dropped to a point where some appliances may not work as they should. With a lot of batteries – depending on the type, the quality and the condition - this can occur well before the battery is at 50%. So, although a battery is rated at 110Ah, it may only give a useable 60Ah at most which, for many people, may be what they would use during the course of a day, especially in the winter.

Even when a LiFePO4 battery is discharged to well below 50%, it will continue to provide a high enough voltage to ensure that appliances operate correctly. *When it's been discharged by approximately 95%, a LiFePO4 battery with a good Battery Management System (BMS) will automatically shut down. However, to maximise useful life, it's recommended that lithium batteries are not continually discharged much below 50%.

5) Thousands of charging cycles compared to just a few hundred from a typical lead-acid battery.

Depending on how a lead-acid battery is designed, manufactured and used, it may have a cycle life (the number of times it can be discharged and charged) of several hundred or far fewer. The way a battery is used makes a huge difference to cycle life and the same make and model of battery could work well for six years or more in one vehicle and less than a year in another.

LiFePO4 batteries have a cycle life in the thousands and, again, the way the battery is used will have an effect. Also, the cells in some LiFePO4 batteries are simply better than others and will have a greater cycle life. For most people, a LiFePO4 battery will last longer than the vehicle they're using it in. For example: using 50 Amp-hours per day, 365 days per year, a 100Ah LiFePO4 battery can be expected to work efficiently for at least 11 years. Use it for only six months of the year and it should last for well over 20 years. Battery life varies according to use and constant heavy discharging will reduce the useful lifetime of the battery.

6) Very low rate of self-discharge means they can be left unattended for months.

If you leave a lead-acid battery unattended, even for a few weeks, you may well go back to it to find that it's flat. This is not only inconvenient but probably expensive too as a battery that's left in a discharged state will suffer from sulphation, leading to damaged cells and an inability to hold a charge.

The discharge rate of LiFePO4 batteries will vary according to how the battery is designed but, as a rule, LiFePO4 batteries discharge much more slowly than lead-acid batteries: 3% per month on average. This means that a fully charged lithium battery can be left in place for months without losing a significant amount of charge. So you never need to worry that you'll be faced with a flat battery.

LiFePO4 batteries work in a completely different way from lead-acid batteries and don't suffer from sulphation. However, it's not recommended to leave a LiFePO4 battery in a discharged state as this could shorten the battery's useful life. Ideally, lithium batteries should be stored with a state of charge between 50% - 80%. The more gently you treat a lithium battery, the longer it will perform efficiently.

There are 3 x 100Ah NDS 3Lion lithium batteries in this Devon campervan. With this amount of electrical power available, even the air-conditioning unit can be run without the need to be on mains hook-up.

7) Zero maintenance required.

A good lead-acid battery being used as a leisure battery should be regularly checked to ensure that electrolyte levels are correct (except for AGM and gel types) and that there's no corrosion.

LiFePO4 batteries are completely maintenance-free.

8) The shape of some models enables them to be installed in places where a lead-acid battery cannot.

With the exception of AGM and gel types, lead-acid batteries have to be mounted with the top of the battery uppermost. This, along with the similar shapes and sizes of most batteries, can make lead-acid batteries difficult to install in certain situations.

Lithium batteries can be installed in any position except upside down. And, because we have a range of models from 20Ah to 150Ah, one of our batteries can be installed in any motorhome, campervan or caravan.

9) Approximately 50% lighter than a lead-acid battery with a similar Ah rating.

Lead is heavy and, the better the battery, the more lead there will be in it. This is one of the major disadvantages of lead-acid batteries, no matter what the application.

LiFePO4 batteries weigh around half what a lead-acid battery with a similar Ah rating would weigh. And, because you can use almost all the energy in a lithium battery, the weight saving can be huge. 2 x 100Ah lithium batteries are roughly the equivalent of 4 x 100Ah lead-acid batteries but the difference in weight can be 60Kg or more.

10) Very safe in normal use with no toxic fumes or liquid and no risk of fire in normal use.

If lead-acid batteries were invented now, they would be forbidden on health & safety grounds. They're full of lead which is poisonous, and acid which burns. And they can explode! Some countries have considered banning them but, as there is no alternative as yet, that hasn't happened.

LiFePO4 batteries are completely safe when used correctly. They are non-toxic, they don't give off dangerous fumes and, in normal use, they cannot explode or catch fire.

11) The ability to charge quickly from the vehicle's engine can remove the need for a generator or fuel cell.

Generators are often used both to charge a leisure battery and provide 230V. But generators have many disadvantages as anyone who's used one or had to listen to someone else's will know. Fuel cells are excellent for charging lead-acid batteries but they are very expensive, take up space and require the use of special fuel which is expensive, often difficult to obtain, hazardous and heavy.

A LiFePO4 battery gives the advantages of both generators and fuel cells. It can be charged simply by running the vehicle's engine and charging is many times faster than even the best fuel cell. If you want to run 230V appliances, an inverter can do the job just as efficiently as a generator and without the inconvenience and noise!

12) Can be used in almost every situation where a lead-acid battery is being used.

Lead-acid batteries have been developed to the point where there's a range of models to suit most applications. But, whatever the type of lead-acid battery, it will have the inherent disadvantages described previously.

There are many different types and models of lithium batteries too but here we are only referring to leisure / auxiliary batteries. Whatever the Ah capacity of the batteries you need, there is probably a LiFePO4 model to suit. Batteries can be joined together to create a battery bank that's big enough even to run air-conditioning systems.

In this motorhome installation, 300Ah of NDS LiFePO4 batteries with an NDS 2kW inverter will enable the use of the air-conditioning as well as the coffee maker!

More and more motorhome manufacturers, including Morelo, are fitting lithium batteries as an option or even as standard.

FAQs about lithium batteries.

Note: When we use the word battery, we mean a single battery or a bank of several batteries joined together.

What's the point of getting a lithium battery?
There are so many reasons. There are 10 good ones at the end of these FAQs.

How do I know what size (Ah capacity) of lithium battery to install?
It's essential that, before installing a LiFePO4 battery, you know what you want to achieve from the installation. You then need to ensure that the battery you fit is suitable. If you don't, it's easy to waste a lot of money.

The first step is to think about how you want to use electricity in your vehicle when you're not connected to mains hook-up (EHU). Most importantly, do you want to be able to use 230V appliances such as a hairdryer, microwave oven, toaster, etc.* If you don't, then a single battery with a capacity of 100Ah or even 60Ah will probably be enough to run lights, TV, water pump, etc. for several days.

If you do, you'll need to work out the power requirements of each of the appliances you want to use and decide how many days you'll need to use them for, without having to charge the batteries. For example, we have supplied lithium batteries for several customers who wanted to run air-conditioning. The minimum requirement to be able to do this is a bank of batteries with a capacity of 300Ah which could run the air-con most of the night depending on the model of the air-conditioner, the temperature required and the ambient temperature.

On the other hand, you may just want to run a hairdryer or microwave oven occasionally or charge batteries for your electric bikes and spend no more than a day or two before driving off again. If that's you, 100Ah or 150Ah of battery could be sufficient. Remember, the less often you deeply discharge the battery, the longer it will last so it makes sense to get a battery that will give you spare capacity.

The ability to charge your battery reliably will make a difference to the Ah capacity of the battery you need. If you have a good solar panel and you're in southern Spain in the summer, you may be able to get away with a smaller capacity battery than you would need during a British winter. If the battery is charged from the vehicle's alternator, running the engine will put energy back in. Again, the amount of charge put into the battery will vary according to various factors.

If you're unsure what size battery to go for, get advice from someone who really knows what they're talking about.

*If you want to use 230V appliances, you'll need an inverter. Find out more about inverters on page 6.

There are so many lithium batteries available, and they all look the same: how do I decide which one to buy?
You could buy the cheapest but, with lithium batteries (as with most things), you really do get what you pay for. It's a massive business in China and there are hundreds of factories turning out all kinds of batteries of varying size, type and quality. The type of cell and the battery management system (BMS) that's usually built into the battery can vary greatly in quality and this will dramatically affect the performance and working life of the battery.

As a rule, cheap batteries will have some or all of the following limitations: only two or three can be connected in parallel, discharge rate will be limited, charge rate will be limited, cells will be low-cost / low-grade, the BMS will be made to a price, not a level of performance and so may not protect the cells adequately, the construction of the battery, including connections, wires and other components will be low-cost / low-grade. For some users, a battery of this type may be sufficient but, if you want a battery you can rely on for many years, a cheap lithium battery is almost certainly a false economy.

At RoadPro, since 2015 we have fitted lithium batteries to hundreds of different makes and types of motorhome, caravan and boats. So, we have a good idea of what works and what doesn't. We've learned that there are good batteries and not so good and that some batteries, while looking OK on paper, don't perform as they should.

There are several factors to look out for in a battery's specifications and one of the most important is the discharge rate. If you want to use a 1,500W hairdryer when you don't have EHU, the battery needs to be able to discharge constantly at 125 Amps. Check the specs of the battery but don't believe everything you read. Some batteries, such as the Aceleron "Essential" have been tested and certified by a reputable testing facility such as Intertek. The certification mark UN 38.3 on the "Essentialmeans that the stated performance of the battery is guaranteed.
It's a minefield out there but, if performance, reliability and long life are more important to you than low price, look at batteries from reputable suppliers who know about the products they sell and who have experience rather than just a good line in sales talk.

Can I simply replace my lead-acid battery with lithium?
Yes…and no. It depends on the battery and, in particular, the BMS. A good BMS will be able to protect the battery against over-voltage, over-current and more, even if the battery is just fitted as a direct replacement for a lead-acid battery. A less efficient BMS could fail to prevent damage and, if this happens, you'll need a new battery.
Installing a lithium battery – even a good one - in this way though, without upgrading the cabling between the starter battery and the leisure battery won't give you one of the biggest benefits of a lithium battery: it won't charge at the high rates that are possible and which, for many people, are one of the main reasons for getting a lithium battery. You'll probably see an increase in the charging rate when compared to your old lead-acid battery but it will be a lot less than it could be.

Using a solar regulator, a battery-to-battery charger or a mains charger which doesn't have lithium settings shouldn't seriously damage a good-quality battery but, again, the battery will not be able to perform as efficiently as it should and its working life may be shortened.

What are the charging voltages for lithium batteries and how important are they?
As stated above, to achieve maximum performance and useful life, a lithium battery needs to be charged correctly. The charging requirements of lithium batteries are very different to those of lead-acid batteries. Different batteries need different voltages but a typical LiFePO4 battery should be charged at a constant voltage of no more than 14.6V. Charging at a lower voltage (14.2V for example) will do no harm but charging at above this should be avoided by using suitable charging equipment. Check your battery's specifications before buying a charger.

Do lithium batteries need special 230V chargers?
For fast, safe charging, a special LiFePO4 charger is the best way to keep a lithium battery charged. However,
if your motorhome, caravan or boat is already equipped with a charging system, it will probably be safe to use with a good-quality lithium battery. Make sure that the charger doesn't have a desulphation mode as this could cause problems. If your vehicle is connected to mains hook-up and you have a poor-quality battery, it's advisable to disconnect it when the battery has been fully charged. Again, a good–quality BMS will protect the cells better than a cheap one.

Can I use a solar panel with a lithium battery?
Yes, but again, for maximum performance, make sure that the voltage regulator has a lithium setting. It's not necessary and not a good idea to keep a lithium battery constantly on charge when it's full and a suitable regulator will avoid this. Your supplier or installer should be able to advise further.

Does it matter what alternator my vehicle has?
In a motorhome or caravan, the leisure battery is usually charged from the alternator when the engine is running. Almost any 12V alternator in a modern vehicle will charge a lithium battery. At voltages below 14.4V and if the wiring carrying the charge to the leisure battery isn't up to the job, the battery will not reach 100% state of charge and a battery-to-battery charger may be necessary (see below).

What if my vehicle's engine has a "smart" alternator?
Whatever type of leisure battery you have, if your vehicle's engine has a "smart" alternator and you want to charge the battery efficiently, a battery-to-battery charger is essential. Some motorhomes are fitted with these as standard. There's a wide range of "B2B" chargers available and some will charge your battery much faster than others. For lithium batteries, for maximum performance it's essential that the battery-to-battery charger has a LiFePO4 setting.

Can I use a lithium battery in my caravan and charge it from the towing vehicle?
Yes, we have battery-to-battery chargers designed specially to enable this and it's essential to use one if you want to put a reasonable charge into the leisure battery. However, because the wiring in towing vehicles isn't designed with leisure battery charging in mind, the rate of charge will be much less than can be achieved in a motorhome.

Are lithium batteries safe to use in my motorhome? I've heard they can catch fire.
The batteries that are used as leisure batteries in vehicles and boats use a chemistry known as LiFePO4 – lithium iron phosphate. This type of battery is very safe indeed and, in normal use, cannot catch fire. What's more, there are no harmful gases or dangerous substances in a LiFePO4 battery.

How are lithium batteries affected by temperature?
As a rule, lithium batteries will charge at 0°C - +45°C and discharge at -20°C - +60°C. If the temperature of the battery reaches 0°C, care must be taken not to charge it from the engine, a solar panel, mains hook-up or any other charging source. Charging below this temperature will damage the cells.

All the lithium batteries sold by RoadPro have built-in protection so that, even if they do reach 0°C, they will prevent charging and avoid damage to the battery. As soon as the battery's temperature gets to above 0°C, the BMS in the battery will allow it to accept a charge. We recommend the use of temperature sensors with solar regulators, battery-to-battery chargers and 230V chargers. These help to ensure the most efficient charging.

What's the best way to store a lithium battery: over winter for example?
Unlike lead-acid batteries, LiFePO4 batteries don't deteriorate if left for weeks or even months. They don't self-discharge as quickly either, about 3% per month is typical. So, you can safely leave a lithium battery installed in your motorhome, caravan or boat even over the winter. To maximise the useful life of the battery, keep an eye on the state of charge and try to keep it between 50% - 80%. In cold weather, the BMS in a good lithium battery will prevent charging at temperatures below 0°C but we also recommend using lithium-compatible chargers & solar regulators with temperature sensors.

Will fitting a lithium battery affect my vehicle's warranty?
Changing a lead-acid battery for a LiFePO4 unit shouldn't affect the vehicle's warranty as long as it's installed properly. If in doubt, check with your dealer.

Why would I need an inverter?
An inverter changes 12V DC (or 24V) to 230V AC. You'll need an inverter if you want to run 230V appliances when no mains hook-up is available.

What sort of inverter should I get?
That all depends on what you want to run from it. Find out the highest rating in Watts of the 230V appliances that you'll be using at the same time. Then, add 10% to be on the safe side. If you just have a phone charger, go for an inverter with an output of 50 Watts or less. If you want to run a hair dryer, a coffee machine or a microwave oven, you'll need to consider a 1,500W, 2,000W or even 3,000W model. We always advise people to only run one appliance at a time from their inverter. Don't try using the microwave and the hairdryer together!

There are two types of inverter: modified sine wave and pure sine wave. A pure sine wave inverter will produce electricity almost identical to what comes out of a 13A socket at home. This is essential for the proper operation of some appliances including coffee machines, microwave ovens and electric toothbrushes but any appliance will run better on electricity from a pure sine wave inverter.

Modified sine wave inverters are cheaper but won't operate some equipment. Simple appliances such as kettles will probably be OK but others either won't run at all or may even catch fire. With a pure sine wave inverter, you can be certain that all your appliances will work correctly. With inverters, as usual, you get what you pay for.

Can I use the 230V sockets in the motorhome when I'm not on hook-up?
Yes, by using a special inverter or separate switch which prevents mains hook-up and the inverter trying to supply the sockets at the same time. It's not a simple job and, if done wrongly, could be very dangerous. We don't recommend doing it unless you are a qualified electrician.

Is it really true that we can get away without ever using 230V hook-up?
Yes it is, as long as you run your 3-way fridge and heating on gas or diesel. These appliances use too much energy to make running on 12V feasible. Otherwise, a lithium battery and suitable inverter will enable you to run everything that you would if you were on hook-up, with the help of a solar panel and an occasional charge from the engine.

Finally: I always stay on campsites and hook-up to the mains supply. Do I need a lithium battery?
No!! Save your money and buy the cheapest starter battery that you can find.

In a nutshell, here are ten reasons why you should seriously consider installing a LiFePO4 battery in your vehicle or boat…..

1. You want to be able to spend as much time as possible "off-grid".
2. You want to run a coffee maker, hair dryer, microwave oven, toaster, induction hob or any other 230V appliance when you're not on mains hook-up.
3. You need to use medical apparatus - such as a PAP or CPAP device - in your vehicle and would like to be certain that it will function correctly when needed.
4. You'd rather use electrical energy than rely on LPG in your vehicle or boat.
5. You want to save money by not having to pay for mains hook-up ever again.
6. You don't want to ever have to worry again about the lights, the TV or other 12V appliances going off because the battery "has died".
7. You want to save weight in your vehicle.
8. You've had enough of lead-acid "leisure" batteries that only last a couple of years or so.
9. You're tired of having to check your batteries and maintain them even when they're not being used.
10. And finally, because LiFePO4 batteries last so long, they can actually save you money in the long run.

The RoadPro range of LiFePO4 batteries

At RoadPro, we have a range of LiFePO4 batteries to suit just about every requirement. Quality is assured, so is after-sales service and, as we've been selling lithium batteries for several years, we know what we're talking about. Whatever your vehicle or boat, we can help you get a system that will free you from the hook-up lead. We really mean it when we say that you may never have to hook up to the mains again when you're on your travels.

NDS 3Lion Batteries:

The 3Lion range from NDS includes 20Ah, 30Ah, 60Ah, 100Ah and 150Ah LiFePO4 batteries. All models 100Ah & 150Ah models are available with a 3Link connection box and a touch-screen display which shows how the system is performing.

The 3Link unit is ideal for use on Fiat Ducatos, Peugeot Boxers and Citroen Relays which are not fitted with smart alternators. It connects to the vehicle's existing system and gives fast charging up to 75 Amps or more.

There are three 100Ah models, one of which is the same size as a standard 110Ah lead-acid battery, making installation even simpler. Another is a low-priced battery and the third is designed to handle current high current draw.

The babies of the NDS range, 20Ah, 30Ah and 60Ah are mainly intended for use in caravans but can also be used in campervans and motorhomes. Remember: a 60Ah lithium battery is almost the equivalent of a 110Ah lead-acid battery but half the size and half the weight.

Aceleron "Essential" Battery:

The Aceleron "Essential" is the only 100Ah lithium battery for motorhomes, caravans & boats that's both **designed and built in the U.K. – Yorkshire to be precise**. The construction is unique, using a patented "compression" technique which enables the battery to be easily upgraded or repaired should a cell need replacing. The "Essential" comes with a 10-year warranty and cycle life is up to 5,000 depending on how the battery is used.

The "Essential" has been certified by Intertek that it conforms to the very high standards of UN-38.3, meaning that it has passed one of the most comprehensive testing programmes available for batteries.

We recommend the use of Votronic monitoring systems with the "Essential" battery.

The EZA range:

The EZA is an all-in-one 130Ah lithium battery combined with a battery-to-battery charger and a solar regulator – all built in. Powerful and very reliable, we've been selling them since 2015 and we have some very happy customers. As well as the original EZA 130, we also have the 100Ah Energie. The shape and rugged construction of the Energie 100 make it ideal for use in situations where other batteries won't fit.

Both batteries can be installed in any kind of motorhome, caravan or boat and can be used with smart or standard alternators.

Here's some of the stuff you need to get the most from your lithium battery.

As explained previously, it's possible to simply replace a lead-acid leisure battery with a lithium battery.
Even if the battery is a high-quality model such as those made by Aceleron and NDS, you won't get all the benefits that the battery can provide without modifying the vehicle's wiring and using additional charging equipment.

A leisure battery is usually charged from three sources: the alternator (via the starter battery), solar panel/s and mains power. But, because the charging requirements of a lithium battery are different from those of a lead-acid battery, to get maximum benefit, you'll need specialised equipment such as what you see below.

Votronic 15 – 80 Amp
battery-to-battery chargers

NDS Power Service Gold
3-way battery chargers

Votronic Triple
3-way battery chargers

Taking energy from the alternator is the most important way of charging for most people with a lithium battery. This can be done in different ways depending on what type of alternator your vehicle has. Many installations require a battery-to-battery charger such as those from CTEK, NDS & Votronic. This will charge the battery in the same way as a mains charger but by taking its power from the alternator.

NDS & Votronic also have 3-way models which charge from the alternator, mains hook-up and solar panels. Whichever model you choose, you can be sure that your lithium battery will be charged correctly.

CTEK 20 Amp
battery-to-battery charger

High-quality cable:
16/25/35mm

NDS solar panels:
50W – 180W

A lithium battery can accept a high charge – up to 100A in many cases – and this makes it essential that the cables used in the installation are capable of carrying such a high current. Some vehicle manufacturers tend to use the thinnest cable they can get away with and this will prevent a lithium battery from performing at its best. All the charging equipment we sell has instructions on what type of cable to use.

For charging from mains hook-up/shore-power, the charger that comes with many vehicles may be sufficient if there's a gel or AGM setting. Again though, for maximum performance and long life, a dedicated lithium charger is advisable. The same applies to solar regulators: one with a lithium setting is well worth it in the long run.

Votronic solar regulator
140W – 530W

Votronic battery
computer

NDS inverters
400W – 3,000W

Many people like to keep any eye on their battery and a monitor such as Votronic's battery computer will show you exactly what's happening: state of charge, voltage and current in and out. Lithium batteries work well with inverters, enabling you run almost any mains appliance at any time, including microwave ovens and hairdryers.

It doesn't matter what type of motorhome or caravan you have, lithium will set you free!

Since February 2015, RoadPro has been telling people about the virtues of lithium batteries and we've supplied hundreds to manufacturers, dealers, installers and our own customers. The most common reaction from people when they convert to lithium is "It's great not having to worry about the battery any more". Other people have told us that having a lithium battery is "like wild-camping with hook-up", enabling them to stay in places like the lakeside in the photo. We have two lithium batteries in our Rapido and, over two years and many thousands of miles, haven't been on mains hook-up once. That's in spite of regularly using a toaster, microwave oven, coffee maker and hair dryer.

To be frank, if you mostly stay on campsites, don't even think about converting to lithium, it's just not necessary. An interesting exception to that rule is if you have a caravan and use a mover. If you do, you may find that an NDS 20Ah or 30Ah lithium battery will stop you running out of juice every time you try to use it.

If you spend time off hook-up though, a lithium battery can change the way you use your motorhome or caravan and, whatever you've got, there's a battery to suit.

Merve is a keen caravanner who enjoys the more relaxed atmosphere of campsites without hook-up and other facilities. Thanks to a 100Ah NDS 3Lion lithium battery, inverter and solar panel he now has complete electrical independence and can still use all his mains appliances without worrying about having hook-up available. Merve says that now he wouldn't even consider not having a lithium battery in his caravan.

A lot of Hymer owners convert their vans to lithium and this 4x4 model is a great example of how lithium batteries can set you free. The owner has travelled all over Europe and Morocco and spends months at a time on the road. Thanks to 400Ah of NDS 3Lion batteries, he can stay away from campsites as much as he wants and yet still run the air-conditioning when the going gets hot.

A lithium battery will usually fit in the same place as the lead-acid battery it's replacing. Even under one of the front seats is possible as there are lithium batteries available which are almost exactly the same size as standard lead-acid models.

So, whatever size your vehicle is, if you want to set it and yourself free from the worries of 12V power, you can!

Lithium batteries are for boats as well as land-based vehicles. We've supplied them for use on narrowboats, sailing boats and work boats too.

Even if a boat doesn't have or doesn't use an engine, because lithium batteries are so efficient, they can make perfect sense on the water.

Here are the thoughts of just a few of our customers on their lithium batteries.

Brian Williams has a Dethleffs motorhome and, in August, 2017, RoadPro installed 2 x 100Ah NDS 3Lion lithium batteries in it along with a 50A battery-to-battery charger. Brian wrote to us in February, 2020 to tell us how he's been getting on. This is what he says:

Since fitting the lithiums we've done around 700 days without hook up. It's absolutely possible to manage completely without hook-up using the batteries and our 300 Watts of solar power. Out here on the Algarve we certainly don't need hook up, even in winter. We've already done over 20 days and will have completed around 70 days before we return to the UK, all without hook up and including long periods without driving the van. We even use a small fan heater on the inverter some mornings when it can be quite cool, there's no problem doing that with the two batteries.

The NDS 3Lion batteries replaced two AGM leisure batteries; the AGMs weren't cheap at over £500 fitted but after around 300 nights, they were clearly starting to deteriorate. If we had continued with lead acid batteries we would now be looking at a third replacement set after 700 nights, making the initially high cost of lithiums start to make sense.

NDS claim 2,500 cycles down to 20% capacity for the lithiums compared to around 350 cycles to 50% for the AGMs. We fitted two lithiums in order to avoid discharging them too heavily, with the result that they have rarely been used to more than half capacity. As a result the theoretical life of our lithiums is well in excess of 2,500 cycles. Even that figure provided by NDS is well over 6 times the life of good quality leisure batteries. With our NDS units currently performing at 100% capacity after 700 cycles there's every reason to believe that they will last for as long as we need them, also enhancing the resale value of our van when we decide to sell.

Unlike lead acid batteries, lithiums present very little resistance when charging and therefore they make the best possible use of solar output. Our battery capacity means we can wait several days until there is enough bright weather to restore our state of charge. Alternatively, a couple of hours on the road will restore our power reserves to 100% using a powerful charge from the alternator.

One of the benefits for us of fitting lithium batteries is that they remove anxiety about battery capacity when living off grid, even in winter. Europe is full of motorhome parking areas offering basic facilities free of charge. We use these areas much more regularly than before we fitted our lithium batteries, knowing that we can rely on our power supply and live in comfort. It's another factor when adding up their net cost, there's really no need to use expensive sites. We obviously need to be sensible about how much power we use but in practice we never need to think about our lighting, use of the TV, coffee machine, hairdryer or food processor. More often than not, our battery reserves are such that we can save gas by using an electric kettle.

We also have the satisfaction of using renewable energy most of the time when we're touring, our energy costs amount to no more than a few pounds worth of gas per week for our fridge and boiler. On cool mornings we occasionally use an 800 watt fan heater in preference to using our Alde heating which is excellent but which has a big appetite for gas.

I can say from experience that when using an inverter for mains appliances the lithium batteries are a world apart, they clearly have no problem delivering 1,000+ Watts for a kettle where our lead acid units were clearly unhappy and would often give a low voltage warning. Lithium batteries give a very stable output of around 13.2V across most of their capacity and their performance is broadly the same whether they are charged to 50% or 90% and they will happily power an inverter regardless of charge level.

Finally I would like to say thanks for the excellent back-up and support I have received from RoadPro. I'm happy to recommend them as a trustworthy supplier in a market where some lithium batteries are of dubious quality and where there's a certain amount of scaremongering about the supposed risks of replacing trusted technology with something less tried and tested. Having done so myself I can only say how pleased we are with the results and confirm that lithium batteries are vastly superior to lead acid technology for leisure requirements. The icing on the cake is that at some point we expect to begin making savings based on the much longer life of lithium batteries compared to the lead acid alternatives. ***Brian Williams***

"Thank you for the excellent service we received from yourselves when you fitted both our Lithium battery and inverter. We can't tell you how pleased we are with the performance of the battery and the workmanship of Damian. From the first quote to the welcome from Allen who went through the job with us to the fitting of the battery and the inverter were second to none. Nothing was too much trouble for Damian.

We have not had to use hook up since we had the battery fitted in early December. Everything RoadPro promised about the battery was true. Overnight using a compressor fridge, lighting, heating and television it did not fall below 90%. It charged back up to 100% in about half an hour of driving. We would not hesitate recommending Lithium batteries and using RoadPro to fit them. "

Glenn and Jennifer Jones, 29/01/2020

*"Back in 2018 our motorhome was suffering from a very poor performing leisure battery, I was forever checking if it needed charging or dare I say connection to EHU. A call to RoadPro sales put the wheels in motion and a design and quote was sent to me (*for lithium batteries*), this being fully acceptable for what was to be installed. The motorhome was booked in and the installation completed.*

My wife and I now have no concerns what so ever to travel Europe, for example in September 2018 we toured France and Italy, the first week only saw one EHU being used for the night because it was available! We could stop at any Aires or France Passion and know that there would be power to spare from the two 150 AH NDS Lithium batteries, solar panel and associated equipment all neatly installed by Damian, in an area not convenient for storage. We are planning trips to Scotland and then later Europe again. I'd recommend RoadPro for this quality equipment due to their exceptional expertise in the products they use and Professional installation."

Andy Badger, 14/01/2020

*"I would like to thank RoadPro for their excellent work on our caravan (*we installed a lithium battery and inverter*). We are amazed at the difference already. We returned the caravan to our storage and are able to use everything with power to spare. This has never been possible before. Also the complete joy of being able to touch a switch to use the inverter for mains powered 230v equipment without the orange cable. Unbelievable! We are delighted with the professionalism, efficiency and friendliness of the team at RoadPro. We can highly recommend them to anyone requiring similar work on their Caravan or Motorhome."*

Shirley Henshall, 07/12/2019

"I have had my lithium batteries fitted 6 weeks ago and have had time to give them a significant test. I was booked in at RoadPro for fitting in March, after speaking to them I was told I could arrive the night before and stay over on their car park including EHU. Next morning I drove the van inside, I was shown and told exactly what would be fitted and asked if I needed anything else. It was to be 2 x 100 amp NDS Lion batteries which includes a battery monitor colour display, Along with those we needed a mains charger to replace the vans original one, which wouldn't charge lithium's properly, so a NDS Power charger Pro was fitted. Then we had a Votronic 1715 Solar regulator fitted to deal with the 200 watt of solar we have on board, and lastly I wanted a Votronic 1250 LCD Solar Computer to monitor what my solar panels were doing. I was loaned a courtesy car for the day and off I went to do some sight seeing for the day.

The van was left in a state that I could stay in it overnight again, so the job could be finished the following day. The courtesy car was available for me again until I got the phone call telling me it was ready. I was shown around the installation and the display monitors, and it was a very neat job with no concerns. The staff were very knowledgeable and friendly and I couldn't have been more happy. The NDS battery monitor shows both batteries at 100% all the time whilst parked up at home with no EHU. The van battery is also fully charged by the system also.

We spent 5 days at Jasmin camping and with the heating, lights, and TV on each night the lowest battery state I saw was 90%, with each morning's sunshine I saw up to 8 amps being put back in resulting in 100% charge by midday. Another 5 nights covering May bank holiday saw lots of cloudy conditions, and by the end of the 4th day still using the same amount of power, I saw the battery state down to 79%. On the 5th day lots of sunshine from early morning saw the batteries back to 100% by 4pm. So 4 days in cloudy conditions saw a 20% fall, these batteries can go down to 5% and still deliver 13.2 volts, so I could possibly do 12 days off grid without any sunshine. I haven't tested the charging capability from the engine

So far I am very happy with the investment of £3500, yes I know you will be saying I could have had 10 batteries fitted for that, but I am not expecting to have to plug in again, and along with the inverter I should be completely independent in every situation. Thanks to the guys down at RoadPro for an excellent job.

Graham Woodcock, 11/05/2019

Merve Gaskin enjoys the peace and quiet of a secluded campsite with as few facilities as possible. We installed a lithium battery in his Bailey caravan in 2018. When he changed his caravan in 2019, naturally Merve wanted to take the battery with him so we re-installed it in his Coachman. This is what Merve says:

I have owned a caravan for near on 30 yrs and in all that time I have had to deal with the normal drawbacks of Lead Acid batteries. When I decided to go completely off grid around 2012, those drawbacks were magnified greatly. I had a decent panel but the weak link in the system was definitely the Lead Acid batteries! In 2018, I had had enough and decided to change to a lithium. I sourced RoadPro and asked them to fit it together with the necessary electronics. All I can say about this battery is that it has literally changed my 'on board' life.

Before, I couldn't run my microwave or toaster as the heavy current draw had destroyed my batteries but now all that has changed. I live virtually exactly the same as I would had I had an expensive EHU! It holds amazing amounts of power, it is about a quarter of the weight of what I used to carry around and it can take heavy discharge and recharge without damage. Without doubt, this is the greatest advance in batteries for over 100yrs and certainly the best decision I've made regarding my on board power. I simply can't see me ever going back to the EHU so sites are now much cheaper and the battery is paying me back every time I go out with the caravan. 2020 will see me paid back in saved site fees for the investment I made 2 years ago! What isn't there to like! Thanks Roadpro.

Merve Gaskin 09/02/20

You can see videos about Merve's caravan and lithium batteries on YouTube.

https://www.youtube.com/watch?v=lNB5pCIving&t=74s & https://www.youtube.com/watch?v=W387BKgZDIo

From D. Atkinson:

For my seventieth birthday I fulfilled a long-held aspiration of owning a genuine 4 x 4 Hymer motorhome with the plan of travelling wherever I wanted until my time ran out. The Hymer was purchased in Germany as a special order and delivered through a German dealer. Because of the high cost of Hymer extras and German labour charges I had the fit out done in England. After some research and advice from other long-term motorhome owners I placed a sizeable contract with RoadPro to bring the Hymer up to a high specification so that I could go off-road for long periods of time. This work included air-conditioning, satellite TV & internet, GMS communications, alarms & security, awning etc.

To ensure electric power self-sufficiency, I took Andrew Harris's expert advice and ordered:

4 x 100Ah NDS 3Lion lithium batteries

NDS 2000 Pure Sine Inverter

Remote Control for NDS Inverter

Votronic 1720 Solar Regulator

6 x 55w MiPV Solarplex Panels

Since hitting the road in the early summer 2018 I have toured extensively in Northern Africa (Morocco, Western Sahara, Mauritania), Germany, Austria, Hungary, Romania, Bulgaria, Serbia, Croatia, Slovenia, crossed Northern Italy and travelled across France into Spain. As I write this review, I am in my second month of touring the Canary Islands and planning to return to the UK sometime in May 2020.

During my travels I have consistently tried to stay off-grid using App recommended Aires & stopping places – some of them well off the beaten track. I have only used formal campsite on occasions when I feel the need a bit of R&R.

Throughout my travels I have always been able to sensibly use my air-con, electric kettle, phone & computer, Dyson chargers, a large induction hob and Foreman grill. On colder winter nights I have run a small 1Kw fan heater on thermostat to save on valuable gas supplies. There have only been a couple of occasions when my battery levels have dropped to a very low status and forced me to switch off and wait for the following days sunshine. In good sunshine battery recharging seems remarkably quick. (There's a bit more that you can see on our website: RoadPro)

D.Atkinson

Hard Parking area in Puerto Noas, La Palma 9/02/2020

Installation of lithium batteries and the other products discussed in this brochure can be complex and, if you're at all unsure about your abilities, we strongly advise getting a professional to do the job.
To find one near you or to ask about installation at RoadPro, send us a message from our website.

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