Frequently Asked Questions

Q. What makes Shorai LFX different from other batteries?

A. Shorai LFX batteries contain Shorai-proprietary eXtreme-Rate Lithium Iron prismatic cells (chemistry LiFePO4). Shorai LFX batteries contain no poisonous lead, no dangerous acid, and do not create explosive gasses during charge, as traditional Lead-Acid batteries do. Compared to lead-acid, Shorai LFX lithium are also extremely light, have much lower self-discharge rate, do not sulfate (i.e. do not degrade while sitting unattended), and are environmentally friendly.

While there are other companies now offering Lithium-Iron based powersports batteries, all except Shorai use cylindrical cells originally made for power tool applications. Such cells are inferior to Shorai Prismatic LFX, for several reasons.

First, the cylindrical cells come only in one size, so that the possible shapes and sizes of the starter batteries they make are very limited. As such, battery fit into many vehicles may be poor, or impossible as they are too wide, or too tall. LFX prismatic cells, on the other hand, are rectangular packages which we can freely design and size according to the size requirements of the battery case. As such, Shorai LFX offer perfect drop-in fit in many vehicles and - if the LFX is slightly smaller in one dimension - high-density, adhesive-backed foam shims are included in the package. These can be applied to the battery box in a few minutes, to insure a perfect “as original” fit. No saws, cutting torches, or duct tape required!

Second is the pedigree. While power-tool cells may crank a vehicle successfully, they were not originally intended for the high current discharges in starter systems. As a result, cranking performance suffers compared to Shorai LFX, and the batteries will wear out more per every start. By contrast, Shorai LFX are the result of years of our own research and development, and are designed and produced in our own tightly controlled factory. Shorai LFX have been used in some of the most extreme high-current projects in the world, including autonomous aircraft, boats, and submarines, electromagnetic rail gun research, and more. In short, LFX have been designed from the “ground up’ to be a powersports starter battery with long lifespan and high performance, under a wide range of temperatures.

Finally there is quality control. Every Shorai LFX is built in our own ISO 9000:2008 certified factory. The primary cell ingredients are sourced from Japan, which allows us to produce the most consistent and reliable cells. Then we do individual cell quality control and matching over a six-week period, for every cell we make. This test period is two to four times longer than typical and is expensive for us. But it is worth it, in terms of product quality in the long run.

Q. Why are Shorai LFX batteries priced below other lithium starter batteries?

A. Shorai LFX batteries are produced exclusively in our own dedicated factory, in large volume, by an experienced production team. The resulting high yields reduces our costs, and the factory-direct connection allows us to offer pricing which is competitive with traditional OEM lead-acid batteries, and lower than any other lithium-based alternative.

Q. How does the LFX "PBeq AHr" capacity rating compare to lead-acid Ahr ratings?

A. First, we need to understand that the primary job of a starter battery is to flow a large current (amperage) for a short time, in order to start a vehicle. In order to do that efficiently, the battery must have low internal resistance. Holding all other considerations equal, the larger the battery is in capacity the lower the resistance, and the better able it is to crank a vehicle under high loads.

Lead-acid makers have therefore used Ahr (capacity) ratings as shorthand to indicate cranking ability, rather than a real usable capacity. The lead-acid capacity rating itself is based on a complete discharge at a low discharge rate. Under actual cranking conditions they will deliver considerably less than spec capacity. And because lead-acid batteries begin sulfating when only a small percentage of the capacity has been used, and their internal resistance rises as they are discharged, the actual capacity which can be USED may be as little as 20% of the mfg. rating. Discharge in excess will not only damage the lead-acid battery, it may not allow proper starting as voltage sags.

Shorai LFX batteries are based on a completely different chemistry. Not only do they have less than 1/3 the internal resistance per capacity than do lead-acid, they are also the ultimate "deep-cycle" battery. The internal "completely discharged" capacity of a Shorai LFX is 1/3 the rated "PBeq" capacity. For example, the LFX18 12V series have 6Ah cells internally. But the cells are capable of 90% discharge without damage and while retaining more cranking ability. As such, the USABLE capacity(or "reserve capacity") of an LFX18 12V battery is on or very near par with 18AHr-rated lead acid batteries, while providing superior cranking performance and a vast reduction in weight. The Shorai PBeq AHr (lead-acid equivalent) rating system therefore allows users to compare a very different technology from lead-acid, but on a close apples-to-apples basis when making a choice.

Q. How does the LFX "CCA" cold-cranking rating compare to lead-acid Ahr ratings?

A. CCA ratings another way that lead-acid makers have tried to convey starting power. Unfortunately, their typical spec is based on a "half-nominal-voltage" delivery. That is, at their CCA spec, you can expect 7.2V delivered, at best; and 7.2V isn't useful, as you won't start a vehicle with it...

In any case, CCA ratings aren't about actually drawing that much current from a battery. The typical vehicle which uses a 200A CCA-rated battery, for example, will only draw 45A~80A from the battery. What the CCA rating really intends to convey is how much voltage will be delivered. Higher CCA rated batteries will deliver more voltage at the same actual cranking current. Our LFX are CCA rated to deliver 9V for a 5-second crank at the CCA rated current. (in fact, our average voltage delivered will be even higher during a 30-second crank. But our CCA ratings are intended to indicate not only a measure of voltage at true cranking currents, but also proper usage, which lead-acid do not) At actual cranking currents - which are always well below CCA, LFX deliver up to two volts more than an equivalent-CCA-rated lead acid battery. Current alone won't start anything. It is the current multiplied by voltage that does the work (watts). In reality, this means that you can multiply the LFX CCA rating by 1.5x to compare to a Lead Acid battery CCA. For example, our 270A CCA LFX18 series provides about the same cranking voltage as a 405A-CCA-rated lead acid battery (from a quality lead-acid maker; some CCA specs we've tested on the cheapest lead acid seemed to be plucked from thin air).

Q. Can I use Lead-Acid battery chargers or charger/tenders?

A. Yes. HOWEVER, you may NOT use a charger/tender if it has an automatic "desulfation mode", which cannot be turned off. We have confirmed with Deltran, makers of the "Battery Tender" brand, that their products do NOT have a desulfation mode, and are therefore OK for use with Shorai LFX, for example. But the best possible charger/tender for Shorai LFX is the SHO-BMS01, which will be released on about March 15th 2011, we expect. It uses the 5-pin BMS port in the LFX batteries, in order to monitor, diagnose, and balance the individual cells during charge. And it also has an optimized storage mode that will give the longest possible service life to your LFX.

If you are storing your vehicle and want to check the remaining capacity, or you're a racer with a constant-loss system, you'll want to know how resting voltage (i.e. with no load or load under 200mA) maps to remaining capacity. LFX batteries should be maintained such that 20% capacity remains at minimum, as best practice. Use a good-quality voltmeter to check remaining capacity, and consider recharge whenever the battery capacity falls to about 50% remaining. Of course, if you get the Shorai dedicated BMS01 charger, you can just hit the "Store Mode" button

and leave it to do the work for you.

No-Load Voltage (V)	No-Load Voltage (V)	Capacity Remaining
12V Eq LFX	6V Eq LFX	
14.340	7.170	100%
13.300	6.650	90%
13.270	6.635	80%
13.160	6.580	70%
13.130	6.565	60%
13.116	6.558	50%
13.104	6.552	40%
12.996	6.498	30%
12.866	6.433	20%
12.730	6.365	10%
9.200	4.600	0%
Do not allow resting voltage to fall below 12.86V for 12V LFX, or 6.43V for 6V LFX		

Q. Should I use a battery tender?

A. The short answer is "only if you really need to". Most powersports enthusiasts have gotten used to hooking up a tender to their lead-acid batteries, all the time. Shorai LFX have much slower self-discharge than the best lead acid do (1/6 to 1/7, on average), they do not sulfate as capacity drops, and they are the ultimate "deep cycle" battery, which means that they can still crank your vehicle even if the remaining capacity is quite low. Therefore most riders will not need to use a tender at all. Even a charger or tender uses energy you have to pay for, and there is always the possibility that a charger or tender can fail in some way, so if not really needed the best practice is to not use one.
A fully charged LFX can sit for a year or more and still retain adequate starting capacity, without damaging the battery. As such, any vehicle which has no current flowing when the key is OFF should never need a tender. At most it should be charged every 6 to 12 months, depending on the average storage temperature (cool storage is much better for any battery). Many older vehicles and most dirtbike / ATV fall into this category.
Newer vehicles may have a significant draw even when the key is OFF, to maintain clocks and computers, etc. In this case we expect that a few hours of riding per month will be all that is needed to avoid tending. If you know that you will go a number of weeks or months without riding, you can either attach a tender, or disconnect the negative cable from the battery. In any case, during storage you may use the voltage chart above and an accurate voltmeter, and consider recharging when the battery is around the 50% capacity remaining mark, or above.

Q. I hear that lithium crank poorly when it gets cold, is that right?

A. Lithium do increase in resistance more as temperature drops, compared to lead-acid. However, they also react to cranking under cold conditions in a much better way. Lead-acid will increase resistance on each subsequent cranking attempt, until it won't turn over. If your LFX fails to start the engine on first crank, that first crank has warmed the battery, and the second attempt will be much stronger, and so on until you get a good start.

Shorai LFX are much better in cold-weather conditions than other-brand lithium starter batteries, due to our eXtreme-rate formulation with low resistance. Down to about 20 degrees Fahrenheit (-7C) most users find that they can start

normally on first crank. If your headlight comes on at key-ON, it is good for the batteries to flow some current before cranking in cold weather. The suggested headlight-on time before cranking depends on the temperature. If starting at 40f (5C), 30 seconds will help wake the battery and increase cranking performance. If at 0f (-17C), leave the lights on for 4~5 minutes before cranking. The result will be a better first crank, and longer battery life. Any other accessories that can be turned on before cranking can also be used for this purpose, such as heated gear, radio, etc...

Q. Can Shorai LFX be fully discharged and then disposed in regular garbage?

A. That depends on your municipal regulations. Shorai LFX batteries meet the European RoHS standards for environmental health, and contain no lead. Check with your local authority to see if LiFePO4 batteries are allowed. If so, fully discharge the battery before disposal, using a 12V light bulb until no longer lit, for example. We expect that there will also be recycling available in some locations, and more coming in the years ahead.

Q. Can Shorai LFX be mounted in any position?

A. Yes. There are no liquids in the LFX batteries.

Q. How long will my LFX battery last?

A. That depends on many factors. Under the worst conditions, a lead acid battery may last only a few weeks and under the best about seven years (top-quality brands with regular use). In between you will find a wide variety of user experiences. Our research indicates an average of about 2 1/2 to 3 years lifespan for lead-acid. Under the same average usage conditions, we expect Shorai LFX to last roughly double, or 5 to 6 years. Under ideal usage and storage conditions, we expect 8 to 10 years to be achievable. Due to their lack of sulfation and slow-self discharge, Shorai LFX increase battery life most for users who sometimes store their vehicles for weeks or months at a time, and don't want to or can't use a battery tender.

Q. The terminal screws seem too short for my vehicle, which has thick cable eyelets. What can I do?

A. First, see the install guides on our site. They show how to use the foam padding (5mm shown, but 10mm sections may be even better) on the nut bottoms, so the nuts rise to the top of the terminals. This helps the screw threads catch the nut. If that isn't enough, note that the screws are M5x0.8 pitch. Any hardware store should have a selection of those, so take a terminal screw to compare and get slightly longer screws, as well as some washers to make sure that the screw doesn't penetrate "too far" when tightened down. We should also have longer screws in stock by Feb 2011, for the rare times when they'll be needed.

Q. Will Shorai be making batteries for cars?

A. We have no solid introduction date in mind for automotive versions at this time, nor do we explicitly recommend that our LFX be used in automotive applications, simply because they have not yet been certified internally for that application. However, 24 to 36 PbEq AHr versions in larger cases (for large touring bikes, in particular) are available now. We expect car racers to use these batteries at their own risk, as well as our current LFX18 series, either as single in small cars or wired in parallel for larger engines.