



A Quick Guide to Drone Batteries

Usage and Maintenance

Lithium-ion batteries are the only source of power for consumer drones. Using and Maintaining drone batteries properly is important to ensure drone flight safety, and safety of users and others.

Understanding Battery Cells Voltage:

Drones use Lithium battery cells. A single cell voltage 3.8V is the rated operating voltage. The actual voltage of a lithium battery cell is 2.75v Min to 4.375V Max when fully charged. The capacity marked on the lithium battery is the amount of electricity obtained by discharging from 4.35V to 2.75V.

Charging the batteries:

Never leave drone batteries charging unattended:

- Charging a drone battery is most important. Charging is the most likely time for a drone battery to catch fire, so concentrate the bulk of your safety efforts there. According to the CPSC, more than half of the drone-battery incidents documented at hospital emergency rooms occurred while the drone was charging.
- If you can, charge your batteries outdoors. the single safest way to charge a drone battery is to do it outdoors. That's the only place you can be sure it isn't near anything else that can catch fire. An exploding battery also gives off toxic gases, which can be dangerous in an enclosed space. Just be sure to keep the batteries out of the sun so they don't overheat, and away from dried-out plants or other combustibles.
- If you have to charge indoors, set up fire-containment measures just in case. You can charge batteries inside cinder blocks, use ammo boxes and or just get yourself an old Microwave oven and use it as a safe box to charge and or store your batteries inside. and keep a bucket of sand nearby to extinguish flames. If you must charge indoors and you choose one of these methods, make sure the setup isn't near anything else that can catch fire. Never seal a battery inside a fireproof container. all that energy needs to go somewhere, and sealing it off will just cause the container to explode. That's why good fire containment focuses on aiming flames and gases in a safe direction and then getting sand or water on it as fast as possible.

Warning! Over Charging the Battery:

- Always use supplied and dedicated Hubsan Drone Battery Chargers. These chargers are specially designed to charge your drone batteries safely and balance each cells properly. Also they have safety voltage cut off, and power cut off features once a battery is fully charged.



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Never use after market Chargers:

- If you use after market chargers there maybe a chance those chargers will not stop charging when battery is fully charged and or over charge the battery and its cells, may not cut off the power in time when battery cells are full. It will damage the built in Battery management unit. Over Charging can lead to battery cells heating up, swelling and immediate explosion causing fire around it.
- We highly recommend to always use only stock supplied chargers that come with drones. Never leave the batteries unattended when charging. Please read more caution and advise, tips regarding charging below in this document.

Using Drone Batteries

Let's begin with some general tips on using the batteries in your aircraft.

1. Start off by downloading and reading the manual for your specific flight battery and drone before taking them out for a flight. Make sure you understand the basic functionality before you fly. Pay particular attention to the section on the Intelligent Flight Batteries.
2. Only fly your drone with a fully charged battery that is securely mounted in the aircraft. As part of your pre-flight checklist, you should ensure the batteries are properly fitted and charged to 100%.
3. Never install or remove a battery from an aircraft when it's turned on.
4. Avoid flying your aircraft erratically. This includes sudden changes of direction or abrupt braking. This will quickly drain the battery as the motors will be working harder than they need to. Try to keep your operation to steady movements and slow braking for longer flight times. We understand that this isn't always possible but for general drone use, you should aim to follow this tip.
5. Make sure you follow the operating temperature guidelines found in the user manual for your aircraft. Flying in cold temperatures will reduce your battery capacity and warm temperatures may lead to irreversible battery failure.
6. If you have multiple batteries for an aircraft, it's recommended you cycle through your batteries and avoid using just one. Balance the pressure you put across your batteries. Label your batteries may help.
7. At least every 20 cycles, complete charge and discharge the aircraft's battery. This will help optimize the life cycle of the battery. Unlike previous LiPo batteries, this won't cause lasting damage to your battery as long as you limit how often it's done.
8. Keep the connectors on your batteries, chargers and aircraft clear of debris and dust. The connectors can be cleaned with a clean and dry cloth or compressed air canister. Be careful when cleaning to avoid damage to the connectors. Never use sharp pointy and metal objects or tools to clear the debris or connectors of your battery or drone. The metal object can cause short circuit and damage to battery and or immediate fire.
9. If you encounter a battery error, try running your battery down to 0% then recharging. Unlike previous LiPo batteries, Intelligent Flight Batteries retain some charge which helps avoid irreversible errors when discharging a battery.



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Warning! Over Discharge:

These Lithium batteries must be used within the given voltage range of 2.75v - 4.35V. If the voltage of a single cell is lower than 2.75V, that causes an over-discharge. In such cases the lithium battery cell will start to swell up and the internal chemical liquid will crystallize. These crystals may pierce the internal structure layer and cause a short circuit, or make the lithium battery voltage zero. Or in some cases fire and explosion when trying to charge such damaged cells.

Never over discharge the battery:

- If we look at the discharge curve of the battery, at the beginning of the discharge / use, the voltage drops relatively quickly, but when the battery cells are discharged between 3.9V and 3.7V, the voltage does not drop too fast. Once it drops to 3.7V per cell, the voltage drop speed will increase. If continue to use battery, it can lead to over discharge, which can damage the battery, may cause the battery to stop working, and cells may start heat up and swelling, if the voltage drops too low.
- Take extreme cautions and never over discharge the battery. You should not fly the drone and or use the battery if its about to over discharge. Always keep an eye on your Drone App prompts to return to home and or immediately land in case of battery levels dropped to critical low.
- Avoid flying in extreme temperatures. To give batteries the longest life possible, follow the manufacturer's instructions for flying, which should include a safe temperature range and a lowest acceptable discharge level.
- Don't drain the battery too fast. Flying at full throttle for long periods—which can be preferable for some flying purposes, such as racing and agility—can also drain batteries so fast that they enter a dangerous process known as thermal runaway, where the materials inside the battery heat up and cause chemical reactions that prompt the battery to heat up even more.

Discharging and Storing the batteries

- If you are not going to fly your drone for more than 7 days, you must discharge your drone batteries to storage level (3.8v per cell) and then store them safely. If you store a fully charged battery for more than 7 days, it will damage the battery cells in the long run. You may encounter swelling up battery and or a battery that does not fully charge and or does not perform as it used to.
- The new digital batteries of Hubsan Zino 2+ Drones automatically will discharge over time and each cell will get down to 3.8v (storage level) but Zino Pro series drone batteries must be manually discharged. You can fly your drone and just hover it until battery is at 50% - 60% level and then safely store the battery.
- The battery should be stored in a cool, dry environment. When storing the battery for a long time, it is best to put it in a sealed bag or a sealed battery fireproof explosion proof bags. The recommended ambient temperature is 10~25°C, and it is dry and non-corrosive.



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Damaged Batteries

- Always take good care of your drone batteries. Handle with care and do not drop the batteries.
- Unfortunately if you crashed your drone and or dropped the battery and you see damage to battery and or cell, you should stop using it and properly dispose it off.
- Do not try to open or repair a drone battery yourself.

Transporting the batteries:

- Keep batteries padded and secured in transit. As long as you monitor, charge, and store your batteries appropriately, they should be okay to transport without any extreme safety measures. Keep them secured in a place where they won't bump around too much. Always use and store batteries in fireproof explosion proof battery bags when transporting.
- Pack your drone and its batteries in your carry-on baggage for a flight. If you plan to take a drone on an airplane, read up on the current rules for batteries for the airline you are traveling with. Generally you can pack a lithium battery into a checked bag if it's installed in a drone, but you can't check spare batteries. Regardless, its a good idea to keep a drone with you while you're traveling, to avoid losing it—so count on keeping your batteries in your carry-on luggage.

Inspection of batteries:

Before and after flying a drone or charging a battery, take a moment to inspect the battery. If your drone's battery has any visible damage or is puffing out, you need to dispose of it. However, not every battery will show physical signs of damage. So be extra careful. If you see any signs physically and or warnings from app, please do not use the batteries.

More Battery Safety Tips

- It seems like quite an obvious tip but don't use a battery with any known or visible damage including leaking and swelling. It could result in a drone crash or even worse and is simply not worth the risk. A new battery is a fraction of the cost of the drone, so just don't risk it.
- If your battery comes into contact with water, stop using it immediately and don't use it again. Allow the battery to dry in an open area.
- You should also keep in mind weather conditions such as fog and mist can result in water on your aircraft and batteries, so you will need to take care.
- If a battery ever catches fire, do not use water to put it out as this may spread the fire. Use sand or fire extinguisher designed for electrical fires.
- Store batteries at room temperature in a dry and ventilated place. Never leave batteries in the aircraft as a battery error could result in lasting damage to your drone.
- For added safety, batteries can be stored in a fireproof bag or metal case to avoid issues.
- Short-term Storage – Batteries should be discharged to between 60 and 80% if you're not using them for between one and ten days.
- Long-term Storage – If storing for more than ten days, store the battery between 40 and 60%. Batteries should not be left for over three months without being charged as the battery life will be reduced.
- Intelligent Flight Batteries will automatically discharge after a specified amount of time. You may be able to set this feature in your drone app if your drone supports intelligent flight battery.
- Never store batteries in vehicles other than during transportation. The conditions are usually too hot/cold and can cause damage to the battery.
- Plan your drone's flights so that they are comfortably within the limits of the battery.
- Pro tip: leave a little extra time at the end of each flight in case your drone needs a little extra power for any reason, for example, to counteract strong winds or to hold its position while waiting for the landing zone to clear.
- The lower you push a battery's charge—hitting regularly below 20%—the shorter that battery's life, and the lower its reliability, will be.
- In low temperatures, or when there are strong winds, adapt your missions with shorter flight times in mind—when winds are strong, your drone uses more power, while low temperatures cause the chemistry of the battery to change and it to discharge more quickly.
- In cold conditions, where the air temperature is below 5° C (41° F), try to keep your UAV's batteries warm—ideally at least 5° C—before connecting them to your drone.

Final Pro Tips that may save your drone, you, your house and your life

- Handle Drone batteries with care and extreme caution
- Never charge drone batteries unattended.
- Invest in fire proof safety equipment and fire extinguishing supplies.
- Don't try to save money thinking you can still use a damaged and or swollen battery. Buy a new one and be thankful. Dispose of damaged batteries properly.
- Fly with responsibility and have fun.