

Pocket Guide Li-Ion battery management

How to extend battery life

Atlas Copco



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General Specifications

Atlas Copco Lithium-ion batteries are designed for power with maintained high current output availability. The available current output is not dependent on the remaining power level, meaning excellent capacity is provided even during heavy duty use.

Always read the Safety Information accompanying your battery when purchased to make sure the battery is handled in a correct way.

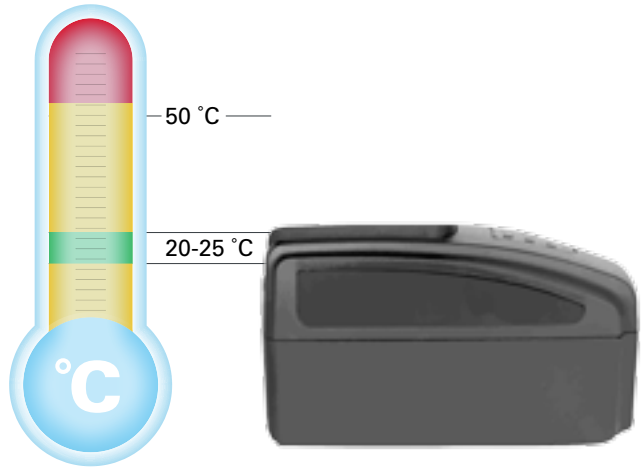


Charging

Do not charge a damaged battery! Only use chargers approved by Atlas Copco. Normal charging time for a fully discharged battery depends on capacity, battery size and type of charger, see Safety Information for your battery type. Always charge batteries maintaining the safety distance prescribed in the Safety Information.”

However, storing batteries in fully charged state causes aging and shortens battery life time. The battery should never be charged below 0 °C, as this imposes safety risks. All Atlas Copco chargers monitors the battery temperature and only allows charging if the battery temperature is within permitted range. The charger will only allow to charge supported batteries. The charger is set to charge the battery to a specific voltage for optimal performance and high safety of the battery.

If unusual noise or heat is identified during charging, unplug the charger and leave the battery for at least 12 hours. Contact safety personnel for further instructions.



Usage

Lithium-ion batteries perform best at around room temperature (20 °C – 25 °C). If used for long periods using high power, the battery will heat up thus aging the battery. If possible, let the battery rest for some time between high power pulses.

When using at very low temperatures ($< 0\text{ °C}$), try to avoid high power pulses as they are harmful to the battery and increase aging. Pre-heating the battery to room temperature is a good solution in cold environments. When changing a battery or attaching a new battery to the tool, make sure the battery is correctly attached to avoid unintentional disconnection of the battery and possible battery damage by the battery hitting the floor. To slide the battery into position should work very easy without high mechanical pressure.

The battery can be mounted in two directions which allows the tool to be used in cramped spaces. Batteries should be disconnected from the power tool during longer shut down periods (e.g. weekends and holiday brakes).



Handling and First aid measures

Batteries should always be handled with care, as they contain a lot of power and energy. Do not touch the terminals, as it can cause electrical shock which can lead to muscle paralyzing effects such as sudden cardiac arrest, respiratory paralysis, or ventricular fibrillation.

Do not tamper with the battery, or try to open it. Avoid dropping batteries to the ground, or in other ways mechanically damage them, as this is a potential safety risk. Keep away from water or other liquids. Keep the batteries away from direct sunlight for extended periods of time, and keep away from heat sources, fires etc. at all times.

If a battery shows signs of damage or have been dropped, scrap and replace it. If the battery is leaking liquids, do not touch them as they are toxic and cause skin irritation or burns and dispose of the leaking battery. If leaking liquids come in contact with the skin, wash with soap and cold water for at least 15 minutes and remove contaminated garments. Seek medical attention if necessary. If leaking liquids come in contact with the eyes, do not rub eyes and immediately flush eyes thoroughly with cold water for at least 15 minutes, then seek immediate medical attention. If leaking gases are inhaled, move to fresh air, monitor breathing and blood circulation, take appropriate first aid/CPR actions if necessary, then immediately seek medical attention.

In case of smoke from the battery or a thermal runaway, use a dry powder extinguisher. For more information, see the product safety data sheet.

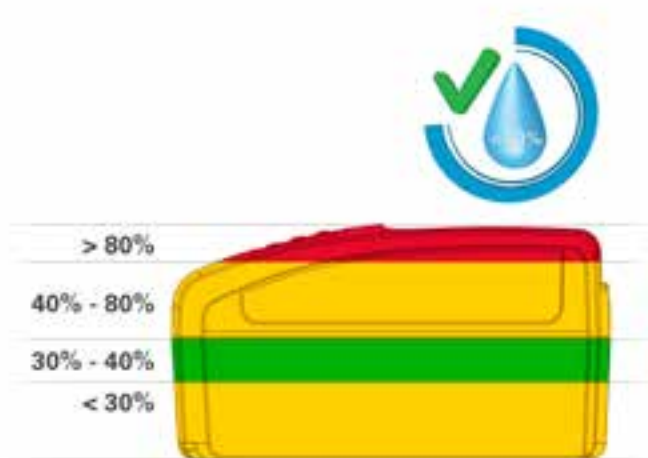




Service life

Under normal usage, the battery will provide around 500 charge/discharge cycles before declared at end-of-life (80 % of nominal capacity). To achieve the longest possible service life it is important to avoid very high and very low temperatures within the battery, as well as long, high-current pulses.

Even though the battery has a specified allowed operational temperature of -20 °C to +60 °C, it will provide the longest service life if temperatures are kept within approximately 10 °C to 40 °C at all times. It is important to remember that the battery ages even when not used. To maximize service life, store batteries at low temperatures (10 °C – 20 °C) and low humidity (<50 % relative humidity) when not used, and avoid storing the battery at full charge.



Storage

The most important thing to remember when storing lithium-ion batteries is to avoid storing them fully charged, as this will age the battery greatly. Instead, store them below 80 % state-of-charge to maximize service life.

Optimally, the batteries should be stored at 30-40 % state-of-charge. Routinely check the charge level of batteries in storage. Do not store your battery connected to the power tool. When stored for long periods of time, regularly (approximately every 6 months) maintenance charge the battery as it will self-discharge and the voltage can drop to levels that are harmful to the battery.

Temperature is also an important parameter when storing lithium-ion batteries. Batteries self-discharge and age slower at lower temperatures. However, the temperature should not be too low, as it can be harmful to the battery. 10 – 20 °C is a good temperature interval for battery storage. Furthermore, avoid storing batteries in a regular refrigerator during storage, as the high humidity is bad for the batteries.

Recycling

Recycling of batteries is extremely important. The main reason is because they are toxic and contain substances that are harmful to the environment, but another strong reason is because of the high financial value of its recyclable components (cobalt, nickel, aluminum, copper, steel). Batteries should therefore never be thrown away in a normal waste bin. Instead return the waste batteries to recycling stations. Before returning the batteries to the recycling station, discharge them completely and secure the contacts, by e.g. using electrical tape, to avoid short-circuiting.





Transportation

Atlas Copco rechargeable Li-ion batteries are regulated for transport according to special provision 188 in the ADR or IMDG code for transport by road or sea, respectively. Transport by air are regulated according to requirements in the IATA DGR. Different transport requirements apply for batteries put in package comprising batteries only (packing instruction 965), batteries with equipment (packing instruction 966) or batteries contained in equipment (packing instruction 967). Note that for transport by air state or airline variations in requirements may apply.

In general the code of practice for packaging and shipment of secondary batteries are as given in IEC 62133: The goal of packaging of secondary cells and batteries for transport is to prevent opportunities for short circuit, mechanical damage and possible ingress of moisture. The materials and pack design shall be chosen so as to prevent the development of unintentional electrical conduction, corrosion of the terminals and ingress of environmental contaminants.

Regulations

The EU battery directive (Directive 2006/66/EU) controls how batteries are handled within the EU. It regulates three different points: labeling of batteries, collection of waste batteries, and recycling of batteries.

All batteries sold in EU must be labeled with the crossed out wheeled bin, to stress that batteries should not be thrown in the regular trash, as well as a battery capacity label. Additionally, if applicable, they must be labeled with the chemical symbols Hg, Cd, or Pb if they contain more than a given amount of these metals (0.0005 % mercury, 0.002 % cadmium, and 0.004 % lead).

Collection targets for batteries are set up within the battery directive. It states that the target for 2016 is that 45 % of all portable batteries should be collected for recycling. Large variations exist within EU. In Sweden, about 64 % of all waste portable batteries are collected, while in Romania, the same figure is only about 14 %.

In terms of recycling, the recycling process efficiencies are regulated in the battery directive. For lithium-ion batteries 50 % of the average battery weight must be recycled.

The EU battery directive also states that it is the battery producer's, i.e. the company that supplies or produces the battery in that state, responsibility to finance the net cost of collecting, treating and recycling of waste batteries, as well as financing public information campaigns about these steps.

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