

## Unit 13 Replica Technische Dienst

### -Batteries-

Batteries come in different shapes and sizes. Besides different shapes, there are also different voltages, different mAh values and different types. This guide explains everything about the difference in types.

#### Pay attention:

- The Voltage largely determines the "Rate Of Fire" of your replica. The voltage has nothing to do with FPS
- The mAh value indicates the capacity of your battery, this mainly determines the playing time!
- The Discharge rate of a battery indicates how much amperage it CAN deliver. A replica only takes as much amperage as it needs. A battery that can deliver 55 amps will not let the replica use 55 amps!
- Good equipment, good maintenance and good sense are very important in everything within airsoft. Be careful with all types of batteries and chargers!



## Battery Types:

### NiCd

This is a Nickel Cadmium battery. These are outdated and are almost no longer used due to toxic composition!

### NiMh

NiMH stands for **N**ickel-**M**etal **H**ydride. They have a higher capacity compared to the NiCd batteries and suffer less from the "Memory Effect". You don't necessarily need a special charger for this type of battery



#### **Pros:**

No special charger needed  
Relatively high capacity  
Can be used in all AEGs

#### **Cons:**

Freezes around 4 degrees Celsius  
Less suitable for high drain  
Relatively high self-discharge (30% per month)

### LiPo

LiPo stands for Lithium Polymer. These batteries are the standard on the market. They have a very high capacity by weight than any other battery, have no memory effect but require more attention when charging and discharging. There are special chargers for the batteries!

Nominal cell voltage: 3.7V

More cells means higher voltage!



#### **Pros:**

High capacity  
Can handle colder temperatures  
Better suited for high-drain applications  
Low self-discharge  
No memory effect

#### **Cons:**

Cannot be deeply discharged or overcharged!  
Possible damage / overcharging may cause explosion and cause a fire!  
Special charger required  
Very sensitive to short circuits!

## LiFePO<sub>4</sub>

LiFePO<sub>4</sub> stands for Lithium-Ferro-Phosphate O<sub>4</sub>. These batteries are not widely used due to the lesser capacity as a LiPo battery, they are many times safer to use. These batteries need a special charger!

Nominal cell Voltage: 3.3V



### **Pros:**

- Much safer compared to LiPo
- High capacity
- No memory effect
- Can handle colder temperatures

### **Cons:**

- More expensive batteries
- Special charger required
- More difficult to find for airsoft use

## 18650 Li-Ion

The 18650 batteries have been around for a while, but they are not widely used in airsoft yet. The biggest advantage of this battery is that they are much safer than lipo batteries and you can play them empty

Nominal Cell voltage 3.7v

Uses a lipo charger!



### **Pros:**

- Much safer compared to LiPo
- No memory effect
- Can handle colder temperatures
- Small format

### **Cons:**

- More expensive batteries
- More difficult to find for airsoft use
- Lower c values

### How a battery works and your replica:

A battery has a number of important factors. Voltage (V), Amp / Hour (mAh) and C value (C).

**Voltage:** This largely determines your rate of fire. At a high voltage your wiring wears out faster (trigger plates). The high voltage causes the trigger plates to spark faster and brighter, eventually damaging them. A higher rate of fire also means faster wear.

**Amps / hour:** This largely determines your capacity and playing time. It stands for the number of amps per hour that the battery can deliver.

**C-Value:** This determines what the maximum ampere output is. There is a formula for this to calculate exactly how much amperage that is.

**C-Rate x Capacity (in Ampere / Hour) = Discharge in Ampere**



### Examples:

Suppose we take a mini type. A very common mini type is one NiMh 9.6v 1500mAh. Most NiMh batteries have a maximum of 8 C. With the formula we can calculate how much amperage it can discharge at the most.

$$8c \times 1.5Ah = 12 \text{ Amps}$$

In this example, we'll take a replica that draws 18 amps (average).

This means that the replica cannot get enough amperage from the battery, so it is not running at its full capacity.

Now we take a 7.4v 2200mAh 20C battery, which is the same size as a mini type.  $20c \times 2.2Ah = 44 \text{ Amps}$ . So this battery has 3.67x more discharge power than the NiMh battery.

This allows the replica to run at its full capacity.

### Pay attention! The replica will never draw more amperage than it needs itself!

It is not the battery that destroys the replica, but what you want from the replica!

This is purely theoretical. A replica also has peak voltage and other variables! This is only a rough indication!

### Wattage:

When calculating battery wattage, we can see why a 7.4v 2200mAh 20c LiPo can be as powerful (if not more powerful) as a 9.6v 3300mAh battery.

$$\text{LiPo: } 20c \times 2.2Ah = 44A \text{ -----} \rightarrow 7.4v \times 44A = 325.6 \text{ Watt}$$

$$\text{NiMh: } 8c \times 3.3Ah = 26.4A \text{ -----} \rightarrow 9.6v \times 26.4 = 253.44 \text{ Watt}$$

So you can see that the (Small type!) LiPo has more power than the 9.6v Large type battery!

### **Maintenance and charging of your batteries:**

Your batteries are an important part of your replica. Below are a few tips on how to properly maintain and charge your batteries.

#### **Global Tips:**

- Never leave your batteries on the charger for too long, even if they are full and even if you have a charger of € 300, -.
- Always keep an eye on your charger and battery. Pay attention to too high temperatures.
- If this is found, remove the battery from the charger immediately!
- Charge your batteries where there is no risk of fire. A military ammunition box is a good option for this.
- When charging LiPo, always use a LiPo safe bag!
- Pay close attention to your battery pack. If it shows damage to the crimp seal or to the wiring, have it repaired (properly) or buy a new battery.
- Do not leave a battery hanging on the charger unattended for more than 2 hours.
- Use proper chargers intended for the battery packs. A good charger switches itself to trickle charging when the battery is full.
- Never charge a battery with an amperage that is too high! A good rule of thumb is not to charge with a higher amperage than the battery pack. So you can charge a 2200mAh battery with a maximum of 2.2 amps, and a 1400mAh with a maximum of 1.4 amps.
- Keep your battery and charger clean and dry

#### **NiMh Battery:**

- Charging with a NiMh charger
- Does not need to be discharged
- Save charged

#### **LiPo Battery:**

- Charging with a specific LiPo Balance Charger!
- Charging in a LiPo safe bag
- Check the balance between the cells with a voltage checker. If these are not equal, the LiPo battery must be balanced!
- When using a LiPo, a LiPo alarm is almost a must! It warns you if you discharge the battery too much or if it becomes too empty! Pay attention! Do not leave the LiPo alarm attached to your battery when you are not using it! The alarm will then drain your battery completely!
- Store the LiPo battery with its factory recommended storage voltage. (normally at 50% capacity)

#### **LiFePO4 Battery:**

- Charging with a specific LiFePO Balance Charger!
- Does not need to be discharged
- Do not let the cell voltage drop below 2.1v!

**18650 Li-Ion Battery:**

- Charging with a specific LiPo Balance Charger!
- Charging in a battery safe bag
- Check the balance between the cells with a voltage checker.

