



# Charger & Solutions

Sealed Energy Systems provides its customers with the electrical power solutions they require. These may be complete custom-made solutions or may be simple and economically priced modified standard products with a relatively short delivery time.

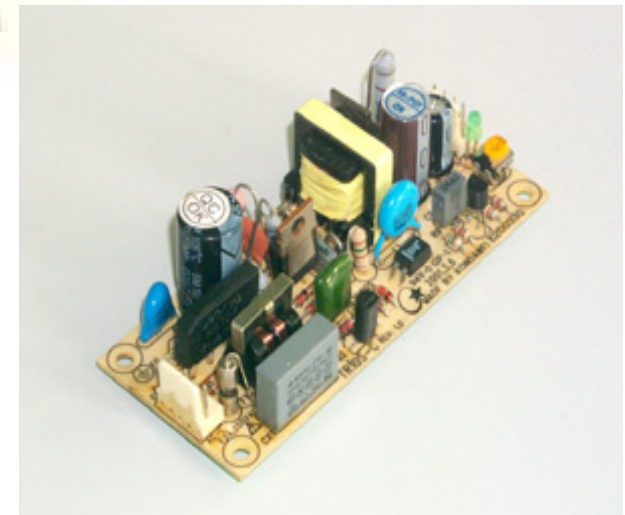
SES's Engineering team has the depth of knowledge to develop custom-made solutions to meet the customers needs in the most suitable and cost effective way.

## **CHARGERS FOR SEALED LEAD ACID BATTERIES**

Lead Acid batteries have an economical price and a long lifetime. They are a good alternative for mobile power if the very low power density and the resulting high weight has no relevance.

Lead acid batteries can be charged with different charging characteristics. It is important that the maximum charging current is never more than the battery specification. Overcharging of the battery is just as bad as an insufficient charge as both have a serious impact on the lifetime of the battery. Therefore, the charging technology chosen has a major influence on the rechargeable lead acid battery life and durability.

SES has chargers with IV and IVOV characteristics in its lead acid standard charger range.





## **IV CHARGING TECHNOLOGY**

This technology charges the rechargeable lead acid battery with a limited current. The current decreases slowly during the last charging phase up to the end charge voltage. The charger can be left connected to the battery during charging.

## **I<sub>VOV</sub> CHARGING TECHNOLOGY**

During charging with the I<sub>VOV</sub> technology the battery first will be charged with a regulated charging current (cycle mode) until its voltage reaches a pre-defined value (2.45 V per cell). After the current has decreased to a defined lower value the charging voltage will be reduced to 2.3 V per cell to avoid damaging by gassing (floating mode).

In comparison to the IV technology the charging with the I<sub>VOV</sub> characteristic achieves a considerably shorter charging time.

While the charger is in operation it can be left connected to the battery. Due to an implemented hysteresis function the charging operation restarts when the battery voltage falls below a predefined value.



## CHARGERS FOR NICKEL METAL HYDRIDE AND NICKEL CADMIUM BATTERIES

The NiMH rechargeable battery has become a popular technology for mobile energy in recent years, due to its constantly increasing power density and economical price. There are various possibilities for charging Nickel Metal Hydride or Nickel-Cadmium batteries.

### STANDARD CHARGING TECHNOLOGY

Trickle chargers are the most basic type and supply a low power continuous charge to the battery with no automatic cut off. They are designed so that the charging current reduces as the cell voltage increases, so offering some degree of charging control at a cost effective price.

Timer chargers have an automatic pre-set timer that is set according to the capacity of the batteries to charge and the fast charging current of the charger. When the pre-set time is reached, the charger switches from fast charge to a slow top-up or trickle charge. This trickle charge will keep the battery at full capacity without the risk of overcharging. A timer charger will charge the batteries with the same amount of energy, regardless of the state of discharge of the batteries at the start of the charging process.

### - $\Delta V$ CHARGING TECHNOLOGY

The most commonly used processor controlled charging method is the  $-\Delta V$  method. The cells will be optimally charged regardless of their energy level at the beginning of the charging process without overcharging. Using this technique a very short charging time is possible.

The increase of the cell's voltage is monitored by a microcontroller. After the cells have reached their end-charging voltage, the cell voltage decreases by a few milli-volts. This characteristic ( $-\Delta V$ ), which is seen in both NiCd and NiMH cells, is used to detect when the cells are fully charged. The charger then automatically switches to trickle charge mode to keep the cells topped up and compensate for their self discharging. For controlling the charging process it is very important to detect the  $-\Delta V$  very accurately.

