# Ni-Cd and Ni-MH charging methods

Portable batteries can be charged at different rates. Applications determine the time of charge and the complexity of the charger, with the rate of charge extending from 15-30 hours down to 30 minutes for an ultra-fast charge. The standard rate of charge for most cycling applications is between C/10 and C/20. With the vastly increased use of portable appliances, there is demand for chargers to provide much faster charging rates up to 4C (i.e. 15 minutes ultra-fast charge). Whatever the rate, it is vital to design chargers to ensure secure operation without overcharging.

## • Permanent charge

When the charge is continuously maintained, regardless of state of charge, the recommended charging rate is from C/20 to C/15.

## • Standard charge

The standard charge is 16 hours. Recommended rate is C/10, which may be applied to all sealed cells and batteries at temperatures between 0 C and + 50 C, whatever the initial state of charge.

## • Quick charge

Applies only to cells designated as “quick chargeable” and at temperatures in the +5 C to +50 C range. Charge 4-5 hours at C/3 or 7–8 hours at C/5, depending on cell type. Appropriate cut-off method (timer or more sophisticated) is required.

## • Fast charge

Fast charge takes from 1 hour to 2 hours. This kind of charge is applicable only to cells designated as rechargeable at such a rate. One or preferably more than one control circuit to terminate the fast charge is necessary. The most suitable cut-off techniques are based on voltage or temperature detection.

## • Trickle charge

Following standard and quick chargers, a “trickle charge”, a continuous charge at a low rate (C/40 to C/20), is recommended in order to compensate for self-discharge, maintain the battery in a fully-charged state, and balance the cells. For fast and ultra-fast chargers, a trickle charge is mandatory.