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BATTERY CHARGING SET POINTS

Battery type	Alloy	Approximate absorption time at 20°C after 50 % DoD	Float voltage at 20°C bij 20°C
Automotive	Antimony (1.6 %)	4 h at 2.50 V / cell (15.0 V) [30.0V] 6 h at 2.45 V / cell (14.7 V) [29.4V] 8 h at 2.40 V / cell (14.4 V) [28.8V] 10 h at 2.33 V / cell (14 V) [28.0V]	2.33 V / cell (14 V) [28.0V] after a few days decrease 2.2 V / cell (13.2 V) [26.4V]
Spiral-cell	Pure lead	4 h at 2.50 V / cell (15.0 V) [30.0V] 8 h at 2.45 V / cell (14.7 V) [29.4V] 16 h at 2.40 V / cell (14.4 V) [28.8V] 1 week at 2.30 V / cell (13.8 V) [27.6V]	2.3 V / cell (13.8 V) [27.6V]
Semi-traction	Antimony (1.6 %)	5 h at 2.50 V / cell (15.0 V) [30.0V] 7 h at 2.45 V / cell (14,7 V) [29.4V] 10 h at 2.40 V / cell (14.4 V) [28.8V] 12 h at 2.33 V / cell(14 V) [28.0V]	2.33 V / cell (14 V) [28.0V] after a few days decrease 2.2 V / cell (13.2 V) [26.4V]
Traction (tubular-plate)	Antimony (5 %)	6 h at 2.50 V / cell (15.0 V) [30.0V] 8 h at 2.45 V / cell (14,7 V) [29.4V] 10 h at 2.40 V / cell (14.4 V) [28.8V]	2.3 V / cell (13.8 V) [27.6V] after a few days decrease 2.2 V / cell (13.2 V) [26.4V]
VRLA-gel Sonnenschein Dryfit A200	Calcium	4 h at 2.40 V / cell (14.4 V) [28.8V] voltage not to be exceeded [1]	2.3 V / cell (13.8 V) [27.6V]
VRLA-gel Sonnenschein Dryfit A600	Calcium	4 h at 2.34 V / cell (14.04 V) [28.08V] voltage not to be exceeded [1]	2.25 V / cell (13.5 V) [27.0V]

[1] = This voltage will change at higher and lower temperatures

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TEMPERATURE COMPENSATION

Temperature is important when charging batteries. The gassing voltage and consequently the optimum absorption and float voltages are inversely proportional to temperature.

This means that in case of a fixed charging voltage a cold battery will be insufficiently charged and a hot battery will be overcharged.

Both effects are very harmful. Deviations of more than 1 % of the correct (temperature dependent) float voltage can result in a considerable reduction of service life (according to some studies up to 30 % when the battery is float charged for long periods of time), particularly if the voltage is too low and the battery does not reach or stay at 100 % charge, so that the plates start to sulphate.

On the other hand over-voltage can lead to overheating, and an overheated battery can suffer “thermal runaway”. Because the gassing voltage decreases with increasing temperature, the absorption and float charge current will increase when the battery heats up, and the battery becomes even hotter, etc. Thermal runaway quickly results in destruction of the battery (the excessive gassing pushes the active mass out of the plates), and there can be a risk of explosion due to internal short-circuits and high quantities of oxygen and hydrogen gas coming out of the battery.

The charging voltage, as quoted by European battery manufacturers, applies at 20°C battery temperature and may be kept constant as long as the temperature of the battery remains reasonably constant (15°C to 25°C).

Although manufacturers’ recommendations differ to some extent, a temperature compensation of - 4 mV / °C per cell is a generally accepted average. This means – 24 mV / °C for a 12 V battery and – 48 mV / °C for a 24 V battery.

Where the manufacturer specifies an absorption voltage of for example 28.2 V at 20°C, then at 30°C the absorption voltage must be reduced to 27.7 V. This is a difference of 0.5 V that certainly cannot be neglected.
When in addition to an ambient temperature of 30°C, the internal temperature of the battery rises another 10°C, which is quite normal during charging, the absorption voltage must be reduced to 27.2 V. Without temperature compensation the charge voltage would have been 28.2 V which would quickly destroy a gel or AGM bank worth some ten thousand Euros!

What the above means is that temperature compensation is important, and must be implemented, especially on large, expensive house batteries, and when a high rate of charge current is used.

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