HOW TO CALCULATE THE VOLTAGE DROP OVER A COPPER CONNECTOR?

Normally you could use for a pre calculation this way:

For the calculation of the internal resistance of the cooper connector, please use this equation:

$$R = \frac{\delta \times l}{A}$$

l – is the length of the connector in m
A – is the cross-section of the connector in mm^2

δ - is the specific constant for copper. The value is $\delta = 0{,}0175 \frac{\Omega \times mm^2}{m}$

For the calculation of the voltage drop please use the Ohms equation: $U = R \times I$:

Example 1:

The cable connector length (the length over all) between the battery and the load (rectifier) is 2 x 10 m and have a cross – section of 50 mm^2. The discharge current is 100 A.

I calculate: $$U = \frac{0{,}0175 \frac{\Omega \times mm^2}{m} \times 20m}{50mm^2} \times 100A = 0{,}7V = 700mV$$

The calculated voltage drop should be added to the minimum final battery voltage:

Example 2:

The battery has 24 cells. The nominal voltage is 48V. The required final voltage by the customer is 43,2 V. The voltage drop of the terminal cable you can find at example number 1.

Without voltage drop over the connector we can calculate: 43,2V / 24 cells = 1,8V per cell.
With compensation of the voltage drop between the battery and the load (rectifier) I calculate 43,2V + 0,7V = 43,9V /24 =1,829 V ≈ **1,83 V**. Now please select from the project planning data the right cell at the table with final voltage of 1,83V per cell.

How we can reduce the voltage drop over the cable?
a.) Reduce the length of the cable, if it is possible
b.) Use the highest cross-section of the cable, witch is available and good for handling.
c.) Use the parallel switching of the cables. For instance a parallel switching of two cable with the same cross – section will divide the voltage drop by factor 2. At a parallel switching of three cables reduce the voltage drop by factor 3.

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