Battery SOC indication FOC200

Because the FOC200 has no communication with the battery’s BMS, the SOC (State of Charge [%]) has the be calculated based on the battery voltage and discharge current.

This is done by implementing the measured relation between SOC and voltage at 0 Amps discharge and compensating the voltage with the actual current multiplied by the impedance of the battery.

uint16\_t battImpedance;

**float** socPolynoom[] = {0,0,0};

**switch**(dParameters.BattChem)

{

**case** 0:

battImpedance = 17;

socPolynoom[0] = 0.65;

socPolynoom[1] = 49;

socPolynoom[2] = 922;

**break**;

uint16\_t BattVoltage = (uint16\_t)(\_IQtoF(gMotorVars.VdcBus\_kV)\*10000);

BattVoltage \*= 10;

BattVoltage += (dDisplayRealTimeData.BatteryCurrent\_A \* battImpedance); //Compensate voltage with 10% of current,

BattVoltage /= 100;

**void** **calcSoc**(**void**)

{

**int** battVolt = dProgramVars.batteryVoltage;//BusVoltageFiltered;///dParameters.BattCells;

**int** soc = (socPolynoom[0] \* battVolt \* battVolt) - (socPolynoom[1]\*battVolt) + socPolynoom[2];

**if**(soc > 100)

soc = 100;

**if**(soc < 1)

soc = 1;

dDisplayRealTimeData.BatteryLevel = (uint16\_t)soc;

}

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Batterijcurves benadering | | |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  | Phylion 14 Ah | |  | Phylion 8,7 Ah | |
| Impedantie [mOhm] | | 126 |  |  |  |  |
|  | 0 Amp | 7 Amp | % |  | 0 amp |  |
| 52 | 52,882 | 0,3 | 97,54098 |  |  |  |
| 51 | 51,882 | 2 | 83,60656 |  | 0 | 100 |
| 50 | 50,882 | 3,1 | 74,59016 |  | 0,2 | 97,31544 |
| 49 | 49,882 | 4,4 | 63,93443 |  | 1,5 | 79,86577 |
| 48 | 48,882 | 5,4 | 55,7377 |  | 2,45 | 67,11409 |
| 47 | 47,882 | 6,5 | 46,72131 |  | 3,43 | 53,95973 |
| 46 | 46,882 | 7,7 | 36,88525 |  | 4,3 | 42,28188 |
| 45 | 45,882 | 8,8 | 27,86885 |  | 5,43 | 27,11409 |
| 44 | 44,882 | 10 | 18,03279 |  | 6,1 | 18,12081 |
| 43 | 43,882 | 10,8 | 11,47541 |  | 6,75 | 9,395973 |
| 42 | 42,882 | 11,4 | 6,557377 |  | 7,15 | 4,026846 |
| 41 | 41,882 | 11,7 | 4,098361 |  | 7,25 | 2,684564 |
| 40 | 40,882 | 11,9 | 2,459016 |  | 7,35 | 1,342282 |
| 39 | 39,882 | 12,2 | 0 |  | 7,45 | 0 |
|  |  |  |  |  |  |  |
| Impedantie [mOhm] | | 126 |  |  | 169 |  |

Test

Override voltage and current with debug parameters to test if the SOC is calculated correct.

Test 1

Test 2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Phylion 14 Ah | |  |  |  | Test 1 |  |
|  | Current |  |  |  |  |  |
| Voltage | 0 | 5 | 10 | 15 | 20 | 25 |
| 55 | 100 | 100 | 100 | 100 | 100 | 100 |
| 54 | 100 | 100 | 100 | 100 | 100 | 100 |
| 53 | 99 | 99 | 100 | 100 | 100 | 100 |
| 52 | 87 | 87 | 99 | 99 | 100 | 100 |
| 51 | 75 | 75 | 87 | 87 | 99 | 100 |
| 50 | 64 | 64 | 75 | 75 | 87 | 99 |
| 49 | 54 | 54 | 64 | 64 | 75 | 87 |
| 48 | 44 | 44 | 54 | 54 | 64 | 75 |
| 47 | 36 | 36 | 44 | 44 | 54 | 64 |
| 46 | 28 | 28 | 36 | 36 | 44 | 54 |
| 45 | 21 | 21 | 28 | 28 | 36 | 44 |
| 44 | 15 | 15 | 21 | 21 | 28 | 36 |
| 43 | 9 | 9 | 15 | 15 | 21 | 28 |
| 42 | 5 | 5 | 9 | 9 | 15 | 21 |
| 41 | 1 | 1 | 5 | 5 | 9 | 15 |
| 40 | 1 | 1 | 1 | 1 | 5 | 9 |
| 39 | 1 | 1 | 1 | 1 | 1 | 5 |
| 38 | 1 | 1 | 1 | 1 | 1 | 1 |
| 37 | 1 | 1 | 1 | 1 | 1 | 1 |
| 36 | 1 | 1 | 1 | 1 | 1 | 1 |
| 35 | 1 | 1 | 1 | 1 | 1 | 1 |
| 34 | 1 | 1 | 1 | 1 | 1 | 1 |
| 33 | 1 | 1 | 1 | 1 | 1 | 1 |
| 32 | 2 | 2 | 1 | 1 | 1 | 1 |
| 31 | 6 | 6 | 2 | 2 | 1 | 1 |
| 30 | 11 | 11 | 6 | 6 | 2 | 1 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Phylion 14 Ah | |  |  |  |  | Test 2 |
|  | Current |  |  |  |  |  |
| Voltage | 0 | 5 | 10 | 15 | 20 | 25 |
| 55 | 100 | 100 | 100 | 100 | 100 | 100 |
| 54 | 100 | 100 | 100 | 100 | 100 | 100 |
| 53 | 99 | 100 | 100 | 100 | 100 | 100 |
| 52 | 87 | 94 | 100 | 100 | 100 | 100 |
| 51 | 75 | 82 | 89 | 97 | 100 | 100 |
| 50 | 64 | 70 | 77 | 84 | 92 | 99 |
| 49 | 54 | 60 | 66 | 73 | 80 | 87 |
| 48 | 44 | 50 | 56 | 62 | 68 | 75 |
| 47 | 36 | 41 | 46 | 52 | 58 | 64 |
| 46 | 28 | 33 | 37 | 43 | 48 | 54 |
| 45 | 21 | 25 | 29 | 34 | 39 | 44 |
| 44 | 15 | 18 | 22 | 26 | 31 | 36 |
| 43 | 9 | 12 | 16 | 20 | 24 | 28 |
| 42 | 5 | 7 | 10 | 14 | 17 | 21 |
| 41 | 1 | 3 | 6 | 8 | 11 | 15 |
| 40 | 1 | 1 | 2 | 4 | 6 | 9 |
| 39 | 1 | 1 | 1 | 1 | 2 | 5 |
| 38 | 1 | 1 | 1 | 1 | 1 | 1 |
| 37 | 1 | 1 | 1 | 1 | 1 | 1 |
| 36 | 1 | 1 | 1 | 1 | 1 | 1 |