How to choose the correct EMRAX motor type for your application?

1. First you need to know what **RPM and torque you will need** for your application.

    To find the suitable EMRAX motor you should check the maximal motor RPM listed in Technical data table for each EMRAX motor. Make sure, to consider the Torque/RPM graph and that the controller gives enough high phase current to get enough high torque from the motor.

2. In the Technical Data table, you can find Specific load speed (RPM/1Vdc) for each EMRAX motor. With this data **you can calculate what battery voltage (Vdc) you need** to achieve desired RPM at load application.
    *It is possible to achieve higher RPM with magnetic field weakening (MFW). You can use magnetic field weakening mode when torque is at maximal value. At magnetic field weakening the torque slightly decreases, but the RPM rises and consequently the power stays the same (look at the equation below). Magnetic field weakening can be set in the controller software**. EMRAX motors have 10 pole pairs, therefore it is recommended to weaken the magnetic field for 5 to 10 % to achieve the best performances**. With higher % of magnetic field weakening the motor can run faster with very good efficiency, which drops only for 1% to 2% at 80% MFW. We recommend MFW only for a short time (few min in case full motor power), because of a very high phase current between the motor and the controller.*

3. Now you can calculate the power, using this equation:
    $$P\,[kW] \;=\; n\,[RPM] * Mt\,[Nm]\,/\,9550$$

    At a lower RPM (motor rotation), you can expect lower motor power at the same torque. At a higher motor speed, you can expect higher motor power at the same torque.

    Mt……torque [Nm]
    P………power [kW]
    n………motor rotation [RPM]
    In case you need higher power, we recommend you increasing battery voltage (Vdc) instead of increasing motor current – because cables with bigger diameter are needed and consequently the weight is bigger. It is better to use a high voltage motor if you need higher motor speed (RPM).

4. **Example for 228 MV**:

    Customer has battery voltage 365 Vdc at load.

    228 MV motor can deliver 11 RPM/1Vdc at load to 14 RPM/1Vdc at no load application.

    In this case the motor the speed is: $365\,[Vdc] * 11 = 4015\,[RPM]$.

    Specific torque for 228MV motor is 0,75Nm/1Arms.

    Therefore at 180 Arms of the current from Bamocar D3, the motor power is:

    $4015\,[RPM] * 135\,Nm \div 9550 = 56{,}7[kW]$ This is the maximum which you can expect with this controller. If you want more power, you need higher dc voltage to get higher RPM and higher motor current. You need app 340 Arms peak (which gives app 230 to 240 Nm of torque with EMRAX 228 MV size). So, if you can increase the current you will be closer to 100 kW. But we recommended that you increase the battery voltage to get higher RPM and consequently higher power. In this case you can use EMRAX 228 HV.