SELECT THE SUITABLE EMRAX MOTOR FOR YOUR APPLICATION

1. First you need to know what RPM and torque you will need for your application. You have to make sure, that the desired RPM and torque (without transmission gear) do not exceed maximal RPM and torque listed in the Technical Data Table for the specific EMRAX motor. You also need to make sure, to consider the Torque/RPM graph! The torque also depends on the controller current of the motor; therefore the controller needs to have enough high phase current to get enough high torque.
2. In the Technical Data Table you can find Specific load speed (RPM/1Vdc). With this data you can calculate how many RPM you will get at desired battery voltage (Vdc) at load application. *It is possible to achieve higher RPM with magnetic field weakening (MFW). You can use magnetic field weakening 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 (take a 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 15-20% 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, 5% 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 to increase 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 speed (RPM).
4. Example for 228 MV:

   Customer has battery voltage 365 Vdc at load.

   228 MV motor can deliver 11 to 14 RPM per 1 Vdc at no load. At full load it can deliver 11 RPM/1Vdc.

   This means that you can get $365\ [Vdc] * 11 = 4015\ [RPM]$ only.
   Therefore at 180 Arms peak from controller from Bamocar D3 (Unitek GmbH), the motor power is: $4015\ [RPM] * 180\ Nm \div 9550 = 75^{\cdot}[kW]$. 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 also higher motor current. You need app 280 Arms peak (which gives app 230 to 240 Nm of torque). 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.