



STM32MotorControl:How To manually configure the motor parameters

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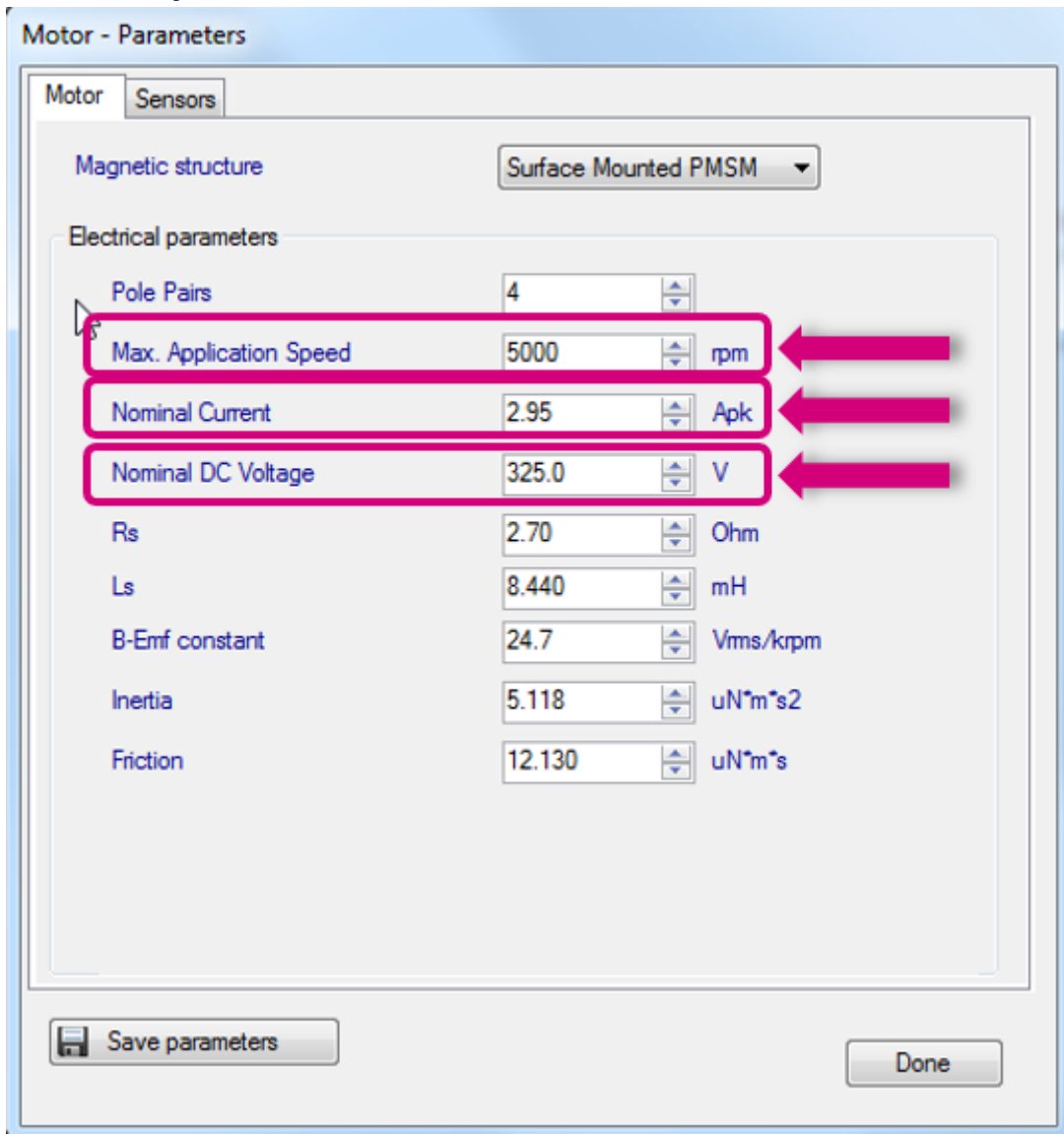
A quality version of this page, approved on 12 May 2021, was based off this revision.

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1 Max Rated Speed, Nominal Current and Nominal DC Voltage parameters

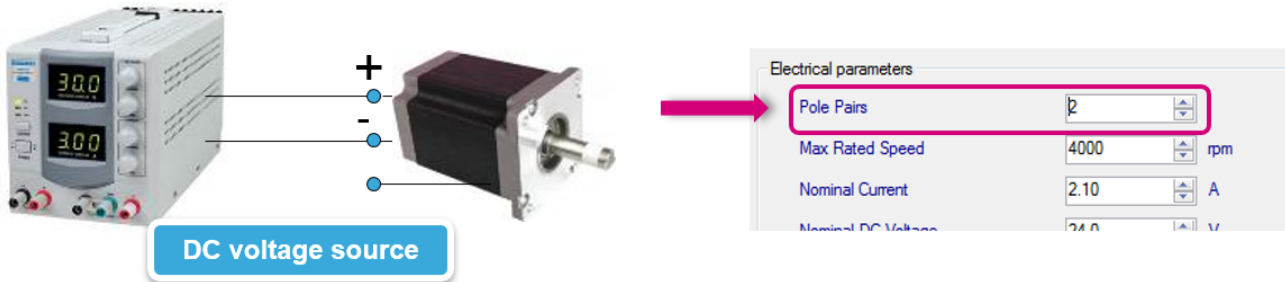
- Set the **Max Rated Speed** to the maximum motor speed according to the application specifications.
- Set the **Nominal Current** to the maximum peak current provided to each of the motor phases according to the motor specifications.
- Set the **Nominal DC Voltage** to the value of the DC bus provided to the inverter or the rectified value of AC input.





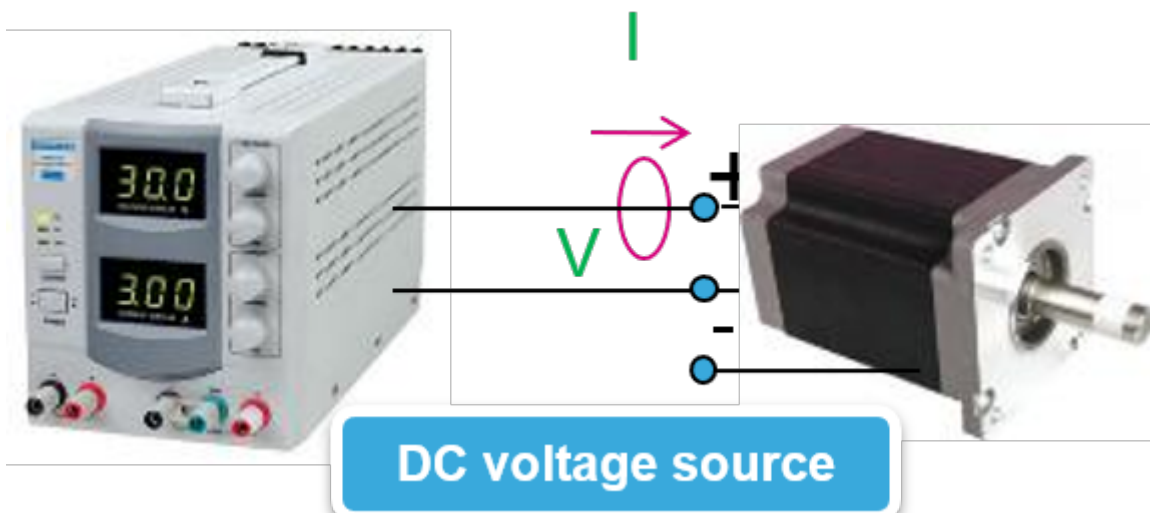
2 Pole pair (number) parameter

- The number of pole pairs is usually provided by the motor supplier, but in case it's not or if you'd like to double-check it:
 - Connect a DC power supply between two (of the three) motor phases and provide up to 5% of the expected nominal DC bus voltage. (You may also set the current protection to the nominal motor current.)
 - Rotate the motor with your hands, you should notice a little resistance, otherwise:
 - If you are not able to rotate the motor, decrease the applied voltage.
 - If the motor does not generate any resistance, gradually increase the applied voltage.
 - The number of rotor stable positions in one mechanical turn represents the number of pole pairs.



3 Stator resistance and inductance parameters

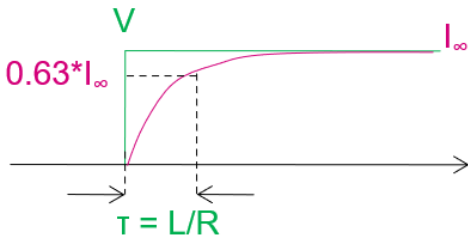
- Using the multimeter, measure the DC stator resistance phase-to-phase (R_s) and divide it by two.
- Connect the DC voltage between two motor phases.
- Connect the oscilloscope voltage and current probes as shown in the figure.
- Increase the voltage up to the value where the current equals the nominal value, so the rotor aligns with the generated flux.
- Don't move the rotor anymore.



- Disable the current protection of the DC voltage source.
- Unplug one terminal of the voltage source cable without switching it off.
- Plug the voltage source rapidly and monitor on the scope the voltage and current waveform until you get something like the one shown in the figure.
- The measurement is good if the voltage can be assimilated to a step and the current increase such as $I * (1 - e^{-t * L/R})$.
- Measure the time required for the current waveform to rise to 63%.



- This time is Ld/Rs constant. Multiply it by Rs and you'll get the Ld value.



Nominal DC voltage	24.0	V
Rs	0.35	Ohm
Ls	0.600	mH

4 Back EMF constant Ke

- The Back-EMF constant represents the proportionality constant between the mechanical motor speed and the amplitude of the B-EMF induced into the motor phases:

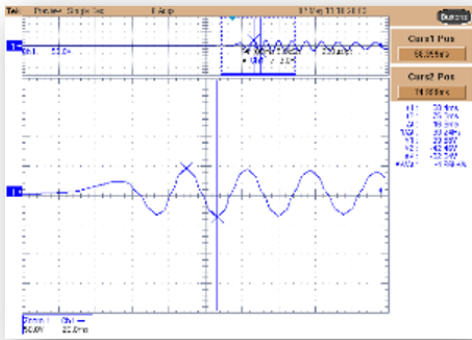
$$V_{Bemf} = K_e \cdot \omega_{mec}$$

- To measure Ke, it usually suffices to turn the motor with your hands (or using a drill or another motor mechanically coupled) and use an oscilloscope to look for the phase-to-phase induced voltage (VBemf)



- Measure the VBemf frequency (fBemf) and the peak-to-peak amplitude (VBemf -A)
- Compute Ke in VRMS / KRPM:

$$K_e = \frac{V_{Bemf-A} [V \text{ peak-to-peak}] \cdot \text{pole pairs number} \cdot 1000}{2 \cdot \sqrt{2} \cdot f_{Bemf} [Hz] \cdot 60}$$



B-EmfConstant Vms/Krpm