Frequently Asked Questions

1. **Does the parameter estimation method account for the non-linear effects of the Ld and Lq, Rs while calculating the reference Id Iq values?**
   The parameter estimation estimates unsaturated Ld & Lq, as the motor is always on no load during these tests. We plan to come up with dyno-based parameter estimation in the future where we can show the effect of inductance saturation by loading the motor (for Lq), and increasing flux (Ld). For the time being, users are enabled to do this on their own, if they have a dyno setup, and understand load tests.

2. **How do I get started to learn about examples of Motor Control Blockset?**
   Please follow this documentation to learn entire workflow step by step with examples, https://www.mathworks.com/help/mcb/getting-started-with-mcb.html

3. **Is sensorless parameter estimation available or do you need position sensor?**
   In 2020a, we currently only support parameter estimation with position sensor, but we'll take into account without sensor to estimate motor parameters in future release

4. **For high power motors, motor temperature changes significantly. How do you maintain the loop performance while winding resistance changed?**
   At present we do not have temperature effect in consideration, as this requires a temperature sensor in the motor windings. The users are encouraged to measure temperature and update PI gain by scheduling different gains at different operating conditions (high temperature, saturation of inductance, etc.) - This is popularly known as "Gain Scheduling", and it's inherently supporte by MCB with the available infrasturcture.

5. **In case of speed input for MTPA block shouldn't it be the feedback speed instead of Ref. speed?**
   It depends on implementation. The MPTA block also implements field-weakening, which works better on hardware if we connect speed reference to the block. Users are encouraged to connect feedback speed and observe the changes in dynamics, and use the best approach of the two.

6. **Is the code optimized for all target MCUs? And the code is MISRA or any standard compliance?**
   Yes, the generated code from MCB blocks are optimized for all target MCUs. The code is generated by Embedded Coder, it offers built-in support for AUTOSAR, MISRA C®, and ASAP2 software standards. It also provides traceability reports, code documentation, and automated software verification to support DO-178, IEC 61508, and ISO 26262 software development.

7. **Can we implement FOC for ebike model adding PAS (pedal assist sensor)?**
   Yes. We have examples that can help you do this in minutes! Please contact MathWorks representative for more details.

8. **Can we use this model to do generative braking model?**
   Yes. All our examples are designed to work in 4-Quadrant operation of electric drive. (It's not just motor control, it's also generator control blockset hidden inside!). While performing regenerative braking, the customer has to take care of energy flow.

9. **What is the Hardware setup, which you are using for this demo?**
   Please refer to following page for supported hardware:
   https://www.mathworks.com/help/mcb/gs/hardware-connections.html

10. **What is the difference between Motor Control Blockset and the already available control blocks in Simscape Electrical?**
    The motor control blockset provides many of reference examples for motor control algorithms, such as field-oriented control for permanent magnet synchronous machine, sensor decoders and observers, motor parameter estimation. On top of that, the control blocks from motor control blockset are optimized for code generation.
    Simscape Electrical provides component libraries for modeling and simulating electronic, mechatronic, and electrical power systems. It includes models of semiconductors, motors, and components for applications such as electromechanical actuation, smart grids, and renewable energy systems. Simscape Electrical helps you develop control systems and test system-level performance.

11. **As inertia and friction parameters of motor vary with load significantly, so how are these parameters identified to have same response in every condition?**
    The parameter estimation tool assumes "no load" condition of the motor, and estimates inertia and friction co-efficient. Measurement of load dynamics are not supported at the moment.

12. **Will this Hardware setup be purchased for our development?**
    Yes. You may refer to following page for supported hardware, choose the one that matches your requirements and order from third-party website (e.g. Texas Instruments):
    https://www.mathworks.com/help/mcb/gs/hardware-connections.html

13. **I tried to integrate some controller codes with C coder and embedded coder, but because of the need of double floating number, embedded coder did not work properly. Are there any ways to solve this problem? For example, eigenvalue calculation for control loop**
    Most of the embedded systems have 32-bit architecture and support floating point math with "single" data-type only. We can help better but need more info on the question. Request you to post this question on MATLAB Central with more details such as target device, toolchain, IDE, error messages received, etc.

14. **Can we use FOC to control the speed of BLDC motor? Could please refer or share an example application (embedded program) for position control of BLDC motor using closed loop algorithm?**
    BLDC motor is controlled by commutation logic with a PID control for speed control, but FOC is widely used for PMSM. To learn more about the control algorithms for BLDC, this link provides a

series of BLDC video, from BLDC modeling to control design. The Simulink demos are also included. It's a great starting point! https://www.mathworks.com/videos/how-to-design-motor-controllers-using-simscape-electrical-part-1-simulating-back-emf-voltage-of-a-bldc-motor-1565241566392.html
https://www.mathworks.com/help/physmod/sps/ref/bldccommutationlogic.html
To generate embedded code from the BLDC control, please follow this short video.
https://www.mathworks.com/videos/embedded-coder-overview-61213.html

15. **Is it possible to generate FPGA code for Simulink plant to be deployed for NI FPGA target?**
    Yes, MathWorks has partnership with several third-party tools so you can generate HDL code and deployed to NI FPGA target. Please see the links to learn more.
    https://www.mathworks.com/products/connections/product_detail/veristand.html?s_tid=srchtitle
    https://www.ni.com/en-us/support/documentation/supplemental/20/matlab---simulink---and-labview-fpga--importing-hdl-coder--expor.html

16. **If I'd target an FPGA, what blocks in the general design would be different?**
    The biggest difference would be converting the data types and arithmetic operations to use fixed-point types. To learn more about generate FPGA Implementations for Field-Oriented Control of Motors, this video shows you the entire workflow.
    https://www.mathworks.com/videos/generate-native-floating-point-fpga-implementations-for-field-oriented-control-of-motors.html

17. **Is there any thermal model of the motors?**
    Yes, with Simscape and Simscape electrical. You are able to model thermal behavior of the motor. This example shows thermal behavior for brushless servomotor.
    https://www.mathworks.com/help/physmod/simscape/examples/motor-thermal-circuit.html
    This example is PMSM with thermal model.
    https://www.mathworks.com/help/physmod/sps/examples/pmsm-with-thermal-model.html

18. **Do you support any other controller tuning to account nonlinear effects?**
    Yes, we support several options for controller tuning on nonlinear effects. This example shows PID controller tuning from Simulink Control System Toolbox and Simulink Control Design.
    https://www.mathworks.com/help/control/ug/pid-controller-tuning-in-simulink.html
    Gain scheduling is another approach for tuning for nonlinear plants.
    https://www.mathworks.com/help/control/gain-scheduled-controller-tuning.html

19. **How the scheduling of different blocks is taken care when the code is generated? is there any scheduler block?**
    Task scheduling is handled by Interrupts for ADC-PWM, and Timer-0 for TI C2000 microcontrollers. Learn more on this at STEP#1 and STEP#5 of the following document:
    https://www.mathworks.com/help/mcb/deployment-and-validation.html
    Also, to learn more about asynchronous scheduling for TI C2000 targets, refer to following link:

https://www.mathworks.com/help/supportpkg/texasinstrumentsc2000/ug/asynchronous-scheduling.html

20. **Can the generated code of motor control be used in automotive and other safety relevant products as well?**
    Yes! You can use the generated code for automotive applications. MathWorks also has multiple features to help you meet certifications and compliance such as ISO 26262, MISRA C, DO-178, and much more. In fact, it is hard to find an automotive these days which isn't running on code-generated by MathWorks product. Get in touch with our Application Engineers to know more.