Documentation

1. Requirements:

The following requirements must be met for the software presented here:

- Wolfspeed Inverter CRD300DA12E-XM3
- CAN hardware and software incl. cable for communication with the inverter
- UniFlash (https://www.ti.com/tool/UNIFLASH)
- Software package (downloadable from this page)
- Needed for software adaptions: MATLAB 2020a (or newer) incl. following toolboxes
    - Simulink
    - Simulink Coder
    - Embedded Coder
    - Stateflow
    - Hardware Support Package für TI C2000

2. Commissioning:

1. Optional: Build Simulink models from software package
2. Use UniFlash to flash CPU images to
    a. CPU1: Wolfspeed_Cree_CPU_1.hex
    b. CPU2: Wolfspeed_Cree_CPU_2.hex
3. Use your CAN software and use wolfspeed_inverter.dbc
4. Parametrize the inverter
    a. QEI interface
        i. QEI_offset_gamma_Tx: adjusting the offset angle
        ii. QEI_number_increment_Tx: impulses per revolution
    b. Machine parameters
        i. p_Tx: pole pairs
        ii. R_s_TX: stator resistance
        iii. L_q_q_Tx: q-axis inductance
        iv. L_d_d_Tx: d-axis inductance
        v. psi_PM_Tx: permanent magnet flux
    c. Switching frequency
        i. f_sw_set_Tx for adjusting switching frequency (if switching frequency is higher than 25kHz please use the interleaving factor 3 model)
    d. Parametrize id and iq limit
        i. i_q_limit_Tx: for limiting i_q setpoint
        ii. i_d_limit_Tx: for limiting i_d setpoint
    e. phase current shutdown limit
        i. i_max_Tx: phase current shutdown limit
5. preliminary tests

a. check speed of QEI (absolute value and sign): speed_mech_Rx
b. check angle of QEI: gamma_el_Rx
c. check current sensors: i_U_Rx, i_V_Rx, i_W_Rx (should be approx. 0A)
d. check DC link voltage measurement by applying DC link voltage
   i. u_DC_Rx

6. Switch on
   a. check error code (errorcode_Rx). If not zero then reset inverter via toggling Reset_error_Tx
   b. set setpoint currents to 0A
      i. i_q_set_CAN_Tx: 0
      ii. i_d_set_CAN_Tx: 0
   c. Apply DC link voltage
   d. Enable control and switching:
      i. Enable_UUT_Tx: 1
   e. Enter setpoint currents
      i. i_q_set_CAN_Tx: within system boundaries
      ii. i_d_set_CAN_Tx: within system boundaries

7. Switch off
   a. set setpoint currents to 0A
      i. i_q_set_CAN_Tx: 0
      ii. i_d_set_CAN_Tx: 0
   b. Disable control and switching:
      i. Enable_UUT_Tx: 0

3. Error codes (errorcode_Rx):

0	No error
10-13	Gate driver fault
14	Parameter change under load
15	Overcurrent
16	Overtemperature
17	Overvoltage
18	Out of memory (logger)
19	ISR execution time too long
20	Control mode change under load
21	Overspeed