Co vše musím měřit:

Obecná měření:

6DOF IMU – přetransformovat do těžiště [Accelerometer Placement – Where and Why | NXP Semiconductors](https://www.nxp.com/company/about-nxp/smarter-world-blog/BL-ACCELEROMETER-PLACEMENT)

[Acceleration Sensor MM7.10](https://www.bosch-motorsport.com/content/downloads/Raceparts/en-GB/245667595336397707.html)

Damper stroke – přepočítat na damper

Metzger 0901218

Brake pressure

[0 261 545 040 Bosch 260bar (3770psi) liquid pressure sensor, Bosch 030 pressure sensor](https://www.bosch-motorsport-shop.com.au/pressure-sensor-for-liquid-260-bar)

[0 261 545 038 Bosch >200bar (>3770psi) liquid pressure sensor, Bosch 038 pressure sensor](https://www.bosch-motorsport-shop.com.au/pressure-sensor-for-liquid-200-bar~32271)

[Snímač tlaku BOSCH - BO 0261545038 | E-shop LKQ CZ s.r.o.](https://www.autokelly.cz/Product/BO-0261545038/8672141)

Steering wheel

[Steering Wheel Angle Sensor LWS](https://www.bosch-motorsport.com/content/downloads/Raceparts/en-GB/54425995191962507.html)

Klávesnice

[Ecumaster CAN BUS - Klávesnice - 12 tlačítek](https://shop.ecumaster.cz/index.php?id_product=87&rewrite=ecumaster-can-bus-klavesnice-12-tlacitek&controller=product&id_lang=1)

**ICE:**

Throttle: Throttle fyzicky je vlastne jen proto aby urcil Torque demand, jak je to s pedalama? Dame tam potenciometr nebo bude cely pedal jiny? **Otazka Tonda**

Jak ovládat ten skutecny throttle – ma to auto mechanicky plyn ten turbomotor nebo to ma elektronickou klapku?

Oil temperature

Water temperature

Fault

Engine RPM

**Electric motor:**

|  |  |  |  |
| --- | --- | --- | --- |
| Life cycle of MCU | MCU\_Counter | Add 1 to each transmission cycle, in Range 0-255 | 0x00 |
| Fault Level | MCU\_FaultLevel | 0-None; 1-Fault Level 3; 2-Fault Level 2; 3-Fault Level 1 | 0x00 |
| Reserved | Reserved0 | Reserved | 0x00 |
| DC bus active discharge status | MCU\_ActiveDischarge\_status | 0-unfinished; 1-finished | 0x00 |
| Initialization status of MCU | MCU\_Init\_Status | 0-unfinshed; 1-finished | 0x00 |
| Reserved | Reserved1 | Reserved | 0x00 |
| Maximum drive torque value is avaliable or not | MCU\_DriveTorqueUpperLimit\_valid | 0-void；1-valid | 0x00 |
| Maximum generation torque value is avaliable or not | MCU\_GenrTorqueUpperLimit\_valid | 0-void；1-valid | 0x00 |
| Actual speed value is valid or not | MCU\_MotorSpeed\_valid | 0-void；1-valid | 0x00 |
| Actual torque value is valid or not | MCU\_MotorTorque\_valid | 0-void；1-valid | 0x00 |
| Actual motor torque | MCU\_Torque | Current torque（high byte 4；low byte 5） | 0x0000 |
| Motor actual rotor speed | MCU\_MotorRPM | Current speed（high byte 6；low byte 7） | 0x0000 |
| MCU control mode | MCU\_Runingmode\_status | 0-standby；1-torque mode；2-speed mode；3-active discharge | 0x00 |
| Motor driving status | MCU\_MotorDrive\_Status | 0-void; 1-motoring; 2-generating; 3-void | 0x00 |
| Motor rotation direction | MCU\_MotorDir\_Status | 0-void; 1-positive direction; 2-negative direction; 3-void | 0x00 |
| MCU enable status | MCU\_MotorEnable\_status | 0-standby；1-disable；2-enable；3-emergency shutdown | 0x00 |
| DC link voltage | Inv1\_DCLinkVoltage | DC Link Voltage（high byte 1；low byte 2） | 0x0000 |
| DC link current | Inv1\_DCLinkCurrent | DC Link Current（high byte 3；low byte 4） | 0x0000 |
| Motor phase current | Inv1\_Motor3PhaseCurrent | Motor phase current（high byte 5；low byte 6） | 0x0000 |
| Motor temperature | Inv1\_MotorTemp | Motor temperature | 0x00 |
| IGBT temperature | Inv1\_IGBTTemp | IGBT temperature | 0x00 |
| Maximum driving torque avaliable | Inv1\_DriveTorqueUpperLimit | Maximum drive torque avaliable（high byte 1；low byte 2） | 0x0000 |
| Maximum generating torque avaliable | Inv1\_GenrTorqueUpperLimit | Maximum generating torque avaliable（high byte 3；low byte 4） | 0x0000 |
| Reserved | Inv1Reserved2 | Reserved | 0 |
| MCU temperature sensor fault | Inv1\_StatusMCUTempSensor\_fault | 0-normal; 1-fault（Level 2） | 0 |
| Motor temperature sensor fault | Inv1\_StatusMotorTempSensor\_fault | 0-normal；1-fault（Level 2） | 0 |
| Active discharge fault | Inv1\_ActiveDischarge\_fault | 0-normal；1-fault（Level 3） | 0 |
| High voltage interlock | Inv1\_StatusHVIL\_fault | 0-normal；1-fault（Level 3） | 0 |
| Torque over limit fault | Inv1\_TorqueCmdOverlimit\_fault | 0-normal；1-fault（Level 3） | 0 |
| Loss communication with VCU fault | Inv1\_StatusVCMLossOfCom\_fault | 0-normal；1-fault（Level 3） | 0 |
| Reserved | Inv1Reserved3 | Reserved | 0 |
| Reserved | Inv1Reserved4 | Reserved | 0 |
| Motor or controller warning | Inv1\_MCUOrMotorOverLoad\_warning | 0-normal; 1-fault（Level 2） | 0 |
| Phase current overcurrent warning | Inv1\_Sta3PhaseOvrCurrent\_warning | 0-normal; 1-fault（Level 2） | 0 |
| DC link undervoltage warning | Inv1\_StaHVDCUnderVolt | 0-normal; 1-fault（Level 2） | 0 |
| DC link overvoltage warning | Inv1\_StaHVDCOverVolt\_warning | 0-normal; 1-fault（Level 2） | 0 |
| MCU overtemperature warning | Inv1\_StatusMCUOverTemp\_warning | 0-normal; 1-fault（Level 2） | 0 |
| Motor overtemperature warning | Inv1\_StatusMotorOverTemp\_warning | 0-normal; 1-fault（Level 2） | q |
| Reserved | Inv1Reserved5 | Reserved | 0 |
| Reserved | Inv1Reserved6 | Reserved | 0 |
| Motor or controller Serious overload fault | Inv1\_StaMCUOrMotorSerOL\_fault | 0-normal; 1-fault（Level 1） | 0 |
| Phase-current serious overcurrent fault (including hardware overcurrent) | Inv1\_Sta3PhaseSerOvCurrent\_fault | 0-normal; 1-fault（Level 1） | 0 |
| DC bus serious undervoltage fault | Inv1\_StaHVDCSerUVolt\_fault | 0-normal; 1-fault（Level 1） | 0 |
| DC link serious overvoltage fault | Inv1\_HVDCSerOverVolt\_fault | 0-normal; 1-fault（Level 1） | 0 |
| MCU serious overtemperature fault(including IGBT capacitor，etc) | Inv1\_MCUSeriousOverTemp\_fault | 0-normal; 1-fault（Level 1） | 0 |
| Motor serious overtemperature fault | Inv1\_MotorSeriousOverTemp\_fault | 0-normal; 1-fault（Level 1） | 0 |
| Phase lost fault | Inv1\_StatusMotorPhaseLoss \_fault | 0-normal; 1-fault（Level 1） | 0 |
| Motor overspeed fault | Inv1\_MotorOverSpeed\_fault | 0-normal; 1-fault（Level 1） | 0 |
| Communication Break with VCU | Inv1\_VCMComBreak\_fault | 0-normal; 1-fault（Level 1） | 0 |
| DC link voltage sensor fault | Inv1\_HVDCVoltageSensor\_fault | 0-normal; 1-fault（Level 1） | 0 |
| Current-Sensor fault | Inv1\_CurrentSensor\_fault | 0-normal; 1-fault（Level 1） | 0 |
| Resolver fault | Inv1\_Resolver\_fault | 0-normal; 1-fault（Level 1） | 0 |
| IGBT fault | Inv1\_IGBTfault | 0-normal; 1-fault（Level 1） | 0 |
| Low voltage undervoltage fault | Inv1\_Status12VUnderVoltage | 0-normal; 1-fault（Level 1） | 0 |
| Motor d-axis actual current | Inv1\_MotorIdAct | Motor d-axis current（high byte 1；low byte 2） | 0x0000 |
| Motor q-axis actual current | Inv1\_MotorIqAct | Motor q-axis current（high byte 3；low byte 4） | 0x0000 |
| Motor d-axis target current | Inv1\_MotorIdCmd | Motor d-axis target current（high byte 5；low byte 6） | 0x0000 |
| Motor q-axis target current | Inv1\_MotorIqCmd | Motor q-axis target current（high byte 7；low byte 8） | 0x0000 |
| Motor d-axis target voltage | Inv1\_MotorUdCmd | Motor d-axis target voltage（high byte 1；low byte 2） | 0x0000 |
| Motor q-axis target voltage | Inv1\_MotorUqCmd | Motor q-axis target voltage（high byte 3；low byte 4） | 0x0000 |
| MCU PWM modulation | Inv1\_PwmModIndx | MCU modulation index | 0x00 |
| Motor maximum torqure limit status | Inv1\_TrqMaxLim\_status | Motor maximum torqure limit status | 0x0 |
| Motor mimimum torqure limit status | Inv1\_TrqMinLim\_status | Motor mimimum torqure limit status | 0x0 |
| MCU pwm gate drive mode | Inv1\_PwmGateDrive\_status | MCU pwm gate drive mode | 0x0 |
| MCU operation state machine | Inv1\_InvMode\_status | MCU operation state machine value | 0x0 |
| Reserved | Inv1\_Reserved7 | Reserved |  |

|  |  |  |  |
| --- | --- | --- | --- |
| Life cycle of MCU | MCU\_Counter | Add 1 to each transmission cycle, in Range 0-255 | 0x00 |
| Fault Level | MCU\_FaultLevel | 0-None; 1-Fault Level 3; 2-Fault Level 2; 3-Fault Level 1 | 0x00 |
| Reserved | Reserved0 | Reserved | 0x00 |
| DC bus active discharge status | MCU\_ActiveDischarge\_status | 0-unfinished; 1-finished | 0x00 |
| Initialization status of MCU | MCU\_Init\_Status | 0-unfinshed; 1-finished | 0x00 |
| Reserved | Reserved1 | Reserved | 0x00 |
| Maximum drive torque value is avaliable or not | MCU\_DriveTorqueUpperLimit\_valid | 0-void；1-valid | 0x00 |
| Maximum generation torque value is avaliable or not | MCU\_GenrTorqueUpperLimit\_valid | 0-void；1-valid | 0x00 |
| Actual speed value is valid or not | MCU\_MotorSpeed\_valid | 0-void；1-valid | 0x00 |
| Actual torque value is valid or not | MCU\_MotorTorque\_valid | 0-void；1-valid | 0x00 |
| Actual motor torque | MCU\_Torque | Current torque（high byte 4；low byte 5） | 0x0000 |
| Motor actual rotor speed | MCU\_MotorRPM | Current speed（high byte 6；low byte 7） | 0x0000 |
| MCU control mode | MCU\_Runingmode\_status | 0-standby；1-torque mode；2-speed mode；3-active discharge | 0x00 |
| Motor driving status | MCU\_MotorDrive\_Status | 0-void; 1-motoring; 2-generating; 3-void | 0x00 |
| Motor rotation direction | MCU\_MotorDir\_Status | 0-void; 1-positive direction; 2-negative direction; 3-void | 0x00 |
| MCU enable status | MCU\_MotorEnable\_status | 0-standby；1-disable；2-enable；3-emergency shutdown | 0x00 |
| DC link voltage | Inv1\_DCLinkVoltage | DC Link Voltage（high byte 1；low byte 2） | 0x0000 |
| DC link current | Inv1\_DCLinkCurrent | DC Link Current（high byte 3；low byte 4） | 0x0000 |
| Motor phase current | Inv1\_Motor3PhaseCurrent | Motor phase current（high byte 5；low byte 6） | 0x0000 |
| Motor temperature | Inv1\_MotorTemp | Motor temperature | 0x00 |
| IGBT temperature | Inv1\_IGBTTemp | IGBT temperature | 0x00 |
| Maximum driving torque avaliable | Inv1\_DriveTorqueUpperLimit | Maximum drive torque avaliable（high byte 1；low byte 2） | 0x0000 |
| Maximum generating torque avaliable | Inv1\_GenrTorqueUpperLimit | Maximum generating torque avaliable（high byte 3；low byte 4） | 0x0000 |
| Reserved | Inv1Reserved2 | Reserved | 0 |
| MCU temperature sensor fault | Inv1\_StatusMCUTempSensor\_fault | 0-normal; 1-fault（Level 2） | 0 |
| Motor temperature sensor fault | Inv1\_StatusMotorTempSensor\_fault | 0-normal；1-fault（Level 2） | 0 |
| Active discharge fault | Inv1\_ActiveDischarge\_fault | 0-normal；1-fault（Level 3） | 0 |
| High voltage interlock | Inv1\_StatusHVIL\_fault | 0-normal；1-fault（Level 3） | 0 |
| Torque over limit fault | Inv1\_TorqueCmdOverlimit\_fault | 0-normal；1-fault（Level 3） | 0 |
| Loss communication with VCU fault | Inv1\_StatusVCMLossOfCom\_fault | 0-normal；1-fault（Level 3） | 0 |
| Reserved | Inv1Reserved3 | Reserved | 0 |
| Reserved | Inv1Reserved4 | Reserved | 0 |
| Motor or controller warning | Inv1\_MCUOrMotorOverLoad\_warning | 0-normal; 1-fault（Level 2） | 0 |
| Phase current overcurrent warning | Inv1\_Sta3PhaseOvrCurrent\_warning | 0-normal; 1-fault（Level 2） | 0 |
| DC link undervoltage warning | Inv1\_StaHVDCUnderVolt | 0-normal; 1-fault（Level 2） | 0 |
| DC link overvoltage warning | Inv1\_StaHVDCOverVolt\_warning | 0-normal; 1-fault（Level 2） | 0 |
| MCU overtemperature warning | Inv1\_StatusMCUOverTemp\_warning | 0-normal; 1-fault（Level 2） | 0 |
| Motor overtemperature warning | Inv1\_StatusMotorOverTemp\_warning | 0-normal; 1-fault（Level 2） | q |
| Reserved | Inv1Reserved5 | Reserved | 0 |
| Reserved | Inv1Reserved6 | Reserved | 0 |
| Motor or controller Serious overload fault | Inv1\_StaMCUOrMotorSerOL\_fault | 0-normal; 1-fault（Level 1） | 0 |
| Phase-current serious overcurrent fault (including hardware overcurrent) | Inv1\_Sta3PhaseSerOvCurrent\_fault | 0-normal; 1-fault（Level 1） | 0 |
| DC bus serious undervoltage fault | Inv1\_StaHVDCSerUVolt\_fault | 0-normal; 1-fault（Level 1） | 0 |
| DC link serious overvoltage fault | Inv1\_HVDCSerOverVolt\_fault | 0-normal; 1-fault（Level 1） | 0 |
| MCU serious overtemperature fault(including IGBT capacitor，etc) | Inv1\_MCUSeriousOverTemp\_fault | 0-normal; 1-fault（Level 1） | 0 |
| Motor serious overtemperature fault | Inv1\_MotorSeriousOverTemp\_fault | 0-normal; 1-fault（Level 1） | 0 |
| Phase lost fault | Inv1\_StatusMotorPhaseLoss \_fault | 0-normal; 1-fault（Level 1） | 0 |
| Motor overspeed fault | Inv1\_MotorOverSpeed\_fault | 0-normal; 1-fault（Level 1） | 0 |
| Communication Break with VCU | Inv1\_VCMComBreak\_fault | 0-normal; 1-fault（Level 1） | 0 |
| DC link voltage sensor fault | Inv1\_HVDCVoltageSensor\_fault | 0-normal; 1-fault（Level 1） | 0 |
| Current-Sensor fault | Inv1\_CurrentSensor\_fault | 0-normal; 1-fault（Level 1） | 0 |
| Resolver fault | Inv1\_Resolver\_fault | 0-normal; 1-fault（Level 1） | 0 |
| IGBT fault | Inv1\_IGBTfault | 0-normal; 1-fault（Level 1） | 0 |
| Low voltage undervoltage fault | Inv1\_Status12VUnderVoltage | 0-normal; 1-fault（Level 1） | 0 |
| Motor d-axis actual current | Inv1\_MotorIdAct | Motor d-axis current（high byte 1；low byte 2） | 0x0000 |
| Motor q-axis actual current | Inv1\_MotorIqAct | Motor q-axis current（high byte 3；low byte 4） | 0x0000 |
| Motor d-axis target current | Inv1\_MotorIdCmd | Motor d-axis target current（high byte 5；low byte 6） | 0x0000 |
| Motor q-axis target current | Inv1\_MotorIqCmd | Motor q-axis target current（high byte 7；low byte 8） | 0x0000 |
| Motor d-axis target voltage | Inv1\_MotorUdCmd | Motor d-axis target voltage（high byte 1；low byte 2） | 0x0000 |
| Motor q-axis target voltage | Inv1\_MotorUqCmd | Motor q-axis target voltage（high byte 3；low byte 4） | 0x0000 |
| MCU PWM modulation | Inv1\_PwmModIndx | MCU modulation index | 0x00 |
| Motor maximum torqure limit status | Inv1\_TrqMaxLim\_status | Motor maximum torqure limit status | 0x0 |
| Motor mimimum torqure limit status | Inv1\_TrqMinLim\_status | Motor mimimum torqure limit status | 0x0 |
| MCU pwm gate drive mode | Inv1\_PwmGateDrive\_status | MCU pwm gate drive mode | 0x0 |
| MCU operation state machine | Inv1\_InvMode\_status | MCU operation state machine value | 0x0 |
| Reserved | Inv1\_Reserved7 | Reserved |  |

Battery:

SOC

Battery voltage

Battery error

Battery temperature in each cell

Battery temperature average

BLOK INPUTS

Zahrnuje plausibility check, manual override, ale nefiltruje

Je to rozdeleno podle skupin – electric motor, ICE, IMU,