Sensorless Speed Mode

1.0 Hardware List

ODESC driver board(24V/56V)
DC power(8V-24V/8-56V)
6354 brushless motor
USB data cable
Power resistance

ODESC purchase link: https://sequremall.com/collections/odesc

2.0 Hardware Wiring

2.1 Connect the power resistor
2.2 Motor cable connection M0
2.3 Power connection ODESC
2.4 Computer connected to ODESC

3.0 Motherboard ODESC Configuration

3.1 Refer to the hardware wiring diagram to complete the hardware connection. Open the terminal, enter odrivetool, ODESC is successfully connected to the computer.

```
odrivetool
```

3.2 Enter odrv0.erase_configuration() and press Enter. Erase old configuration and restore default parameters.

```
odrv0.erase_configuration()
```

3.3 Set the power resistance value.

Note: The power resistance parameter is 50W 2Ω, then the resistance value is configured as 2.

```
odrv0.config.brake_resistance = 2
```

3.4 Set the current value of the power supply overcurrent protection, that is, the maximum current that the power supply device can output.

```
odrv0.config.dc_max_positive_current = 30
```

3.5 Set the overcurrent protection value of the reverse current, the maximum current that the power supply can absorb in the reverse direction, generally a negative value.

Note: This parameter defaults to a conservative value of 10mA. If you use power resistors and get the error DC_BUS_OVER_REGEN_CURRENT, increase this parameter value slightly. If you are not using a power resistor and intend to send braking current back to the power supply, set it to the safe range of the power supply. In this case, this parameter should be higher than the motor's current limit + current limit headroom.

```
odrv0.config.dc_max_negative_current = -2.0
```

3.6 Set the current value of the brake backflow, the current value that the power supply can recover charging.

Note: It is powered by switching power supply, does not have the function of recycling and charging, and the parameter is set to 0. It is powered by battery and can be set according to the actual recharge current that the battery can withstand.

```
odrv0.config.max_regen_current = 0
```

3.7 Set the undervoltage protection value. For this test, use the default parameters and skip this setting step.

Note: Battery powered, to prevent battery over-discharge, you can set this parameter to the safe voltage value of the battery.

```
odrv0.config.dc_bus_undervoltage_trip_level
```

3.8 Set the overvoltage protection value. For this test, use the default parameters and skip this setting step.
Note: If you need to set it, set it according to the voltage version of the ODESC, there are different versions of 24V/56V.
```
odrv0.config.dc_bus_overvoltage_trip_level
```

3.9 Save configuration parameters.
```
odrv0.save_configuration()
```

4.0 Sensorless Speed M0 Configuration

4.1 Set the position loop gain.
```
odrv0.axis0.controller.config.pos_gain = 20
```

Set the speed loop gain.
```
odrv0.axis0.controller.config.vel_gain = 0.02
```

Set the speed loop integral gain.
```
odrv0.axis0.controller.config.vel_integrator_gain = 0.01
```

Note: There are unstable situations such as jitter in the closed-loop state of the motor, and generally these three gain parameters need to be debugged.

4.2 Set to speed control mode.
```
odrv0.axis0.controller.config.control_mode = CONTROL_MODE_VELOCITY_CONTROL
```

4.3 Set the maximum speed of the motor, the unit is [turn/s].
```
odrv0.axis0.controller.config.vel_limit = 100
```

4.4 Set the maximum running current of the motor, the unit is [A].
Note: Combined with the actual use of the motor, set the maximum current limit of the motor.
```
odrv0.axis0.motor.config.current_lim = 50
```

4.5 Set the number of pole pairs of the motor. The number of pole pairs = the number of permanent magnets of the motor/2. You can check the number of permanent magnets of the motor through the motor data manual.
Note: The number of permanent magnets in the 6354 motor is 14, and the number of pole pairs = 14/2 = 7
```
odrv0.axis0.motor.config.pole_pairs = 7
```

4.6 Set the motor running direction.

Note: No sense needs to be set manually, and sense is set automatically under encoder calibration. "1" is the same as the encoder direction, "-1" is opposite to the encoder direction.

```
odrv0.axis0.motor.config.direction = 1
```

4.7 Set the motor flux linkage, the formula is 5.51328895422 / (number of pole pairs * motor KV value).

Note: You can check the motor data sheet, the number of pole pairs of the 6354 motor is 7, and the KV value is 190KV.

```
odrv0.axis0.sensorless_estimator.config.pm_flux_linkage = 5.51328895422/(7*190)
```

4.8 Calibrate the motor and wait for the motor to make a "squeak" sound.

```
odrv0.axis0.requested_state = AXIS_STATE_MOTOR_CALIBRATION
```

4.9 Check the motor error, the return value is "0", the calibration is successful, otherwise solve the problem according to the error prompt.

```
odrv0.axis0.motor
```

4.10 Set the motor has been calibrated, the parameter is True, each restart does not need to re-calibrate the motor.

```
odrv0.axis0.motor.config.pre_calibrated = True
```

4.11 Set the sensorless control mode.

Note: After the setting is completed, put your hand on the motor, the motor will vibrate slightly inside, and the motor will enter the working state.

```
odrv0.axis0.requested_state = AXIS_STATE_SENSORLESS_CONTROL
```

4.12 Set restart to automatically enter sensorless control, the parameter is True.

```
odrv0.axis0.config.startup_sensorless_control = True
```

4.13 Save configuration parameters.

```
odrv0.save_configuration()
```

4.14 Reboot.

```
odrv0.reboot()
```

4.15 To test the motor, enter the target speed of the motor in [turn/s].

Note: Set to a negative number to change the running direction of the motor, and "0" to stop. The target speed setting value and the actual motor running condition are related to the value of position loop gain, speed loop gain and speed loop integral gain.

```
odrv0.axis0.controller.input_vel = 5
```

4.16 The speed estimated by the sensorless observer, the actual speed of the current motor is estimated, and the unit is [turn/s].

```
odrv0.axis0.sensorless_estimator.vel_estimate
```

The basic configuration test has been completed.