STEADYWIN® MOTOR DRIVER APP USER MANUAL

Windows

Skyline Innovation Co.,Limited. (SteadyWin®)

CONTENT

REVISION HISTORY

Version	Data	Revisions
1.0	2021.5.20	First version
1.1	2021.7.15	'INTERFACES' and 'ZERO' added in 'BASICS' options page
1.2	2021.9.2	'DURATIONS' added in 'DRIVE' options page
1.3	2022.3.2	'Enc Reversed' option added
1.4	2022.8.5	'CAN/RS485' interface option added
1.5	2022.8.9	'CAN Protocol' option added
1.6	2023.4.27	'Phase Order', 'Encoder Calibration', 'Firmware Update' added.

1 INSTALLATION

SteadyWin® GIM series motor drivers support android app 'Motor Wizard' for motor settings and tests.

1.1 REQUIREMENTS

✓ Windows 10 with RAM of 2G

✓ With WIFI capabilities

✓ With screen resolution of 1920x1080 or above

1.2 SOFTWARE DOWNLOAD

For different customization requirements, SteadyWin® released different versions for different customers. Please contact local support team for your customized version of APP.

1.3 INSTALLATION

Double click motorwizard.exe and follow the default installation wizard. **Please NOTE: in case that the main UI cannot be shown correctly, please change the screen zoom option to 100%.**
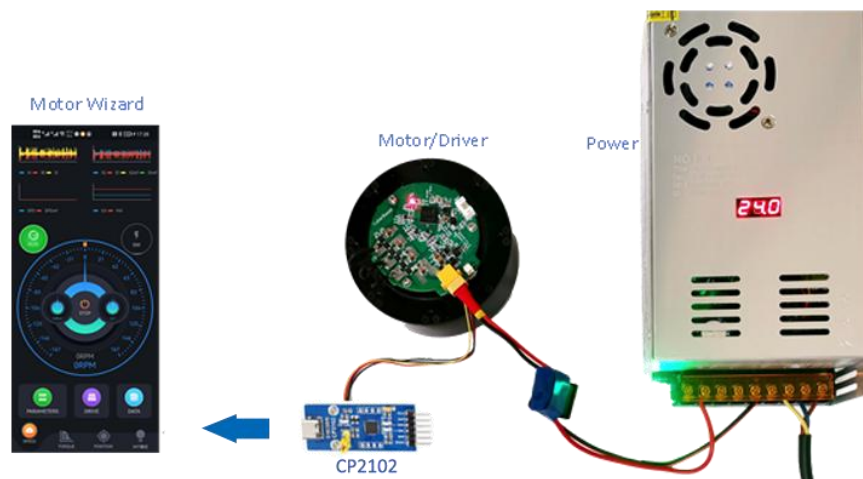
2 CONFIGURATION

2.1 MOTOR CONNECTION

Fig 1 Motor Connection Illustration

Please follow the steps to connect host to motor driver:

> 💡 *Use can identify the phase order (U/V/W) by 'AUTO IDENTIFY' phase order functionality*

1. Weld phase wires to U/V/W of driver board

2. Connect power cable and CP2102 to driver board

Make sure that power voltage be in the limit of the driver board. For the rated voltage limit, please refer to the model number. For example, MW60XX series support the maximum voltage of 60V.

And then, connect CP2102 to the 4-pin connector. Switch on the power, and User should see the LED on.

3. APP 'Motor Wizard' for test

Open 'Motor Wizard', and after a very short-time hint 'Trying connecting to motor', the app should connect to the motor successfully. And then, the app tries to retrieve all parameters from the motor, if successfully, the motor should be in normal state and ready to be tested.

> 💡 *In case of 'Error encountered while retrieving parameters' or 'Timeout while retrieving parameters', please kill the app and restart it.*
> 💡 *Press the right side of the UI and drag to the left, LOG page should be opened, where User can check all running and testing log outputs. Please refer to 4.2 for details.*

2.2 BASIC PARAMETERS

Basic parameters page can be opened by means of:

✓ Clicking the 'PARAMETERS' button

✓ Or clicking the left side of the UI and drag to the right, and clicking 'PARAMETERS' page

Please NOTE:

✓ Be sure to click 'SYNC' button to synchronize all changes to the motor.

> 💡 *The motor must be stopped first before synchronizing any changes.*
> 💡 *All parameters will take effect immediately after synchronizing and resetting.*

✓ Long press 'SYNC' will reset all parameters of the motor.

2.2.1 BASICS

Fig 2 Basic parameters

As illustrated as above, basics parameters include: **Pole Pairs**, **Gear Ratio**, **Voltage Limit**,

Current RS, **LS**, **Torque Constant.** Please NOTE that the above-listed parameters should be

> 💡 *'Voltage Limit' indicates the under-voltage threshold and over-voltage threshold.*
> 💡 *'Speed' indicates the speed of the rotor, not the output shaft.*

correctly set, otherwise the motor may run abnormally.

2.2.1.1 Phase Order

The first and the most important thing User should do before running the motor is to identify the correct phase order. Step as followed:

✓ Fix the motor and unmount all load from output shaft

✓ Power on, and wait until Motor Wizard shows 'the motor is successfully connected'.
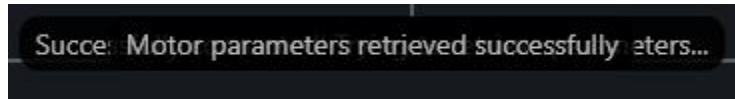
✓ Click 'AUTO IDENTIFY', and the motor will automatically rotate back and forth to find the correct phase order. After the identification process finishes, re-enter the 'BASIC PARAMETER' page and check the identified phase order.

✓ User can also change the phase order manually. Be noted that each time User changes the setting, please 'SYNC' the update to the motor.

2.2.1.2 Encoder Calibration

After phase order identification, User should calibrate the encoder. Steps as followed:

✓ Fix the motor and unmount all load from output shaft

✓ Click 'CALIB', and the motor will automatically rotate back and forth to calibrate the first encoder, and the second encoder if existed.

✓ When the motor stops rotating, User can re-enter the 'BASIC PARAMETER' page and check if the encoder is calibrated or not.
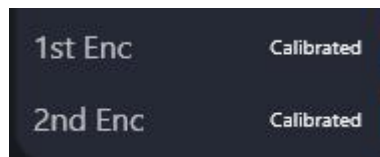
2.2.2 ZERO

'Position' shows the current position/angle of the gear, and User can click 'SET ZERO' button to

> 💡 Current 'Position' can only be retrieved when the motor is running.
> 💡 'Zero' position is single-turn angle of the gear.

set the current position as 'ZERO' position.

2.2.3 INTERFACES

'INTERFACES' indicate parameters of CAN or RS485, including:

✓ CAN or RS485 as bearing interface

✓ CAN parameters: baud rate, CAN ID, CAN MASTER ID

✓ Protocol option:

➢ SteadyWin®

Please refer to < SteadyWin GIM Motor Driver Protocol Specification>.

➢ MIT

The open-source MIT protocol. Please refer to <MIT Protocol Specification>.

Windows version also support to connect to driver using serial port, and user can select the serial port number.

2.2.4 FIRMWARE UPDATE

The driver firmware can be updated with Motor Wizard through serial connection. All parameters will not be lost after firmware update. Steps as followed:

✓ Power on and connect to the motor with Motor Wizard.

✓ Click 'UPDATE' and in the dialog select the firmware file (*.hex), and the update process is illustrated as:

✓ After the update is finished, Motor Wizard will automatically re-connect to the motor.

2.3 DRIVING PARAMETERS (PID)

Driving parameters page can be opened by means of:

✓ Clicking the 'DRIVE' button

✓ Or clicking the left side of the UI and drag to the right, and clicking 'DRIVE' page

Please NOTE:

✓ Be sure to click 'SYNC' button to synchronize all changes to the motor.

> 💡 *The motor must be stopped first before synchronizing any changes.*
> 💡 *All parameters will take effect immediately after synchronizing and resetting.*

✓ Clicking 'RESET' will reset all parameters of the motor.

2.3.1 CURRENT LOOP

Current loop is the kernel the FoC algorithm, which is running in PWM frequency.

Kp/Ki can be tuned for current loop.

2.3.2 FLUX WEAKENING

Flux weakening loop is similar to current loop. Kp/Ki can be tuned.

2.3.3 SPEED LOOP

Speed loop is based on current loop, which is running in the rate of 1KHz. Kp/Ki can be tuned for speed loop.

2.3.4 POSITION LOOP

Position loop is based on current loop, which is running in the rate of 1KHz. Kp/Ki/Kd can be

> 💡 *In most cases Ki for position loop should be set to 0, otherwise vibration may cause unstoppable damage.*

tuned for position loop.

2.3.5 DURATIONS

Duration indicates the target execution time of one single odometer driving command (please see 3.2 for odometer driving). For example, in position control mode, User may drive the motor to turn 200 degrees with one click, which means the motor should turn 200 degrees in pre-set duration, say 500ms. The longer the duration, the lower the motor turns.

2.4 LOG DATA

Log data parameters page can be opened by means of:

✓ Clicking the 'DATA' button

✓ Or clicking the left side of the UI and drag to the right, and clicking 'DATA' page.

On this page User can:

● Enable or disable data log (please refer to 4.1)

● Manage previously generated LOG files, like mailing to an address, sharing or deletion.

> *Multiple files could be selected in the list.*
> *Touch one file and hold to delete.*

3 MOTOR CONTROL AND TUNING

User can control/drive and tune the motor after correct connection and configuration as described in section 2.

3.1 MOTOR START&STOP

As illustrated in Fig 3, click the center 'START' button to start the motor. After successfully starting the motor, the odometer turns from grey to blue/green, and user can click 'STOP' button to stop running.

Fig 3 Motor in IDLE and RUN state

User can see the following elements in the above-right figure: status icon, power indicator, colorful arrows on the odometer, and the mini odometers.

> 💡 *In the UI the big odometer is the driving odometer of the current control mode.*
> 💡 *The mini odometers indicate the other two odometers except the current big one. They cannot be touched to drive, and only show the status.*

3.2 ODOMETER DRIVING

User can drive the motor with mouse like click and drag. Please NOTE that all indicators that are shown on the odometers are for output shaft. For example, the odometer speed is the output shaft's speed.

➢ **Click**

In motor running state, user can click any position of the odometer to drive the motor reach the targeted value, e.g., targeted speed in speed control mode, targeted torque in torque control mode, and targeted position in position control mode.

Please be noted that, one click triggers one single command that is sent to the motor to be executed, and user can set the command execution time in driving parameter configuration page (as in 2.3.5). For faster response, please set smaller execution time.

➢ **Drag**

In motor running state, user can touch any position of the odometer and hold to drag. In this way, user can continuously drive the motor with different targeted values.

➢ **Runtime Indicators**

In the upper part of the main UI, runtime indicators are shown in four charts.

4 LOG ANALYSIS

Motor Wizard records two different LOG data which may help the motor tuning process and monitor.

4.1   DATA LOG

Data log is the log that records motor's runtime indicators. For indicators customization, please contact local support. The following indicators are supported:

Ia Ib I_α I_β Iq   Id   IqRef   IdRef   Vq   Vd V_α V_β Speed   Angle   Position   PositionRef   PositionOmega   PositionAcc

The driver software samples the indicators every 500us. **SteadyWin® support higher sampling frequency, please contact local support for sampling frequency customization**。

Motor Wizard saves data log during every motor running period. Please refer to section 2.4 for how to open 'DATA' log option page.
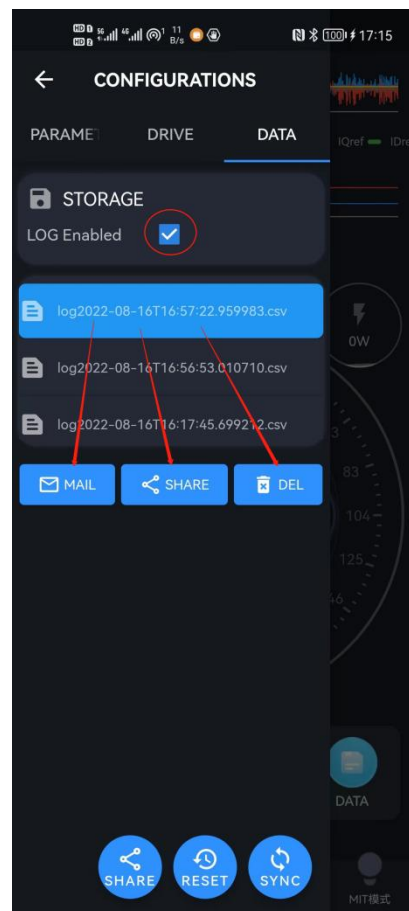

Fig 4 Data log records and share

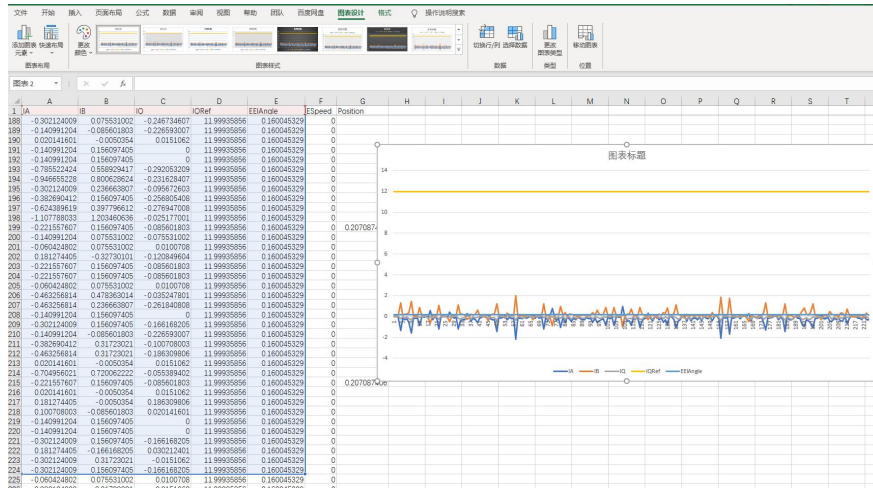Data log is in CSV format which can be analyzed in excel:

Fig 5 Data log analysis in Excel

4.2 DEBUG LOG

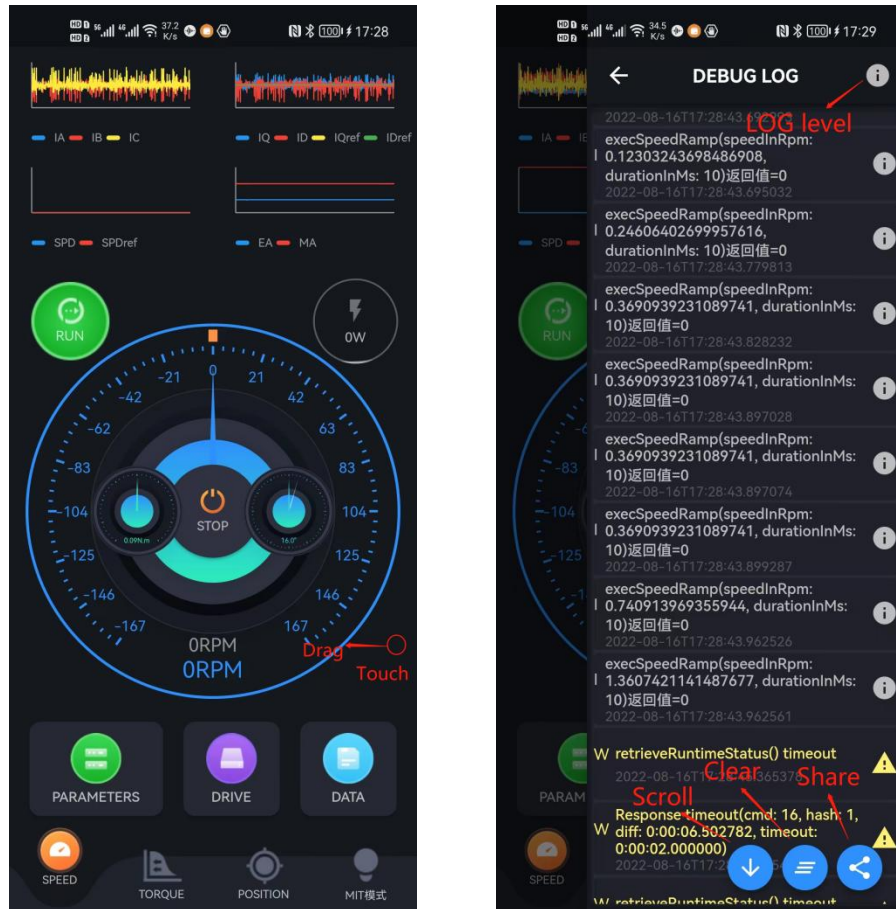Debug log if the log records that software outputs during runtime.

Fig 6 Debug log

Debug log is the basics that help post-sales engineers to debug the problems users may

encounter. In case of any issues, please open the above-mentioned log page and share the log

Windows version does support sharing files. Please refer to system's document directory for latest log file records.

file to support engineers.