MOTOLYSER

Introduction

Thank you for your interest in the **Motolyser II**. This tool is intended for testing brushless DC motors and it's internal components. The performance of the motor is not only related to the end-bell timing. It also depend on alignment and quality of internal parts such as alignment of sensor elements and magnet symmetry. The Motolyser allows you to make measurements of an assembled motor to find out about the performance before you put it in your car and test it on the track.

Features

The measurements are made at no load, with the regulated voltage of 3.7V or 7.4V depending on the number of cells used for supplying the unit. It is intended for 1 to 4 cell Li-Po supply. With the Motolyser you are able to test many aspects of your motor. The *Full Motor Test* runs your motor using the end-bell timing. This enables you to measure the **Battery Current** draw when changing the end-bell timing. It also presents the **True RMS Phase Current** for each motor phase. The *Sensor & Magnet Test* presents information about the **End-bell timing**, sensor condition such as **Alignment Deviation** and **Sensor Element Angles** as well as **Magnet Symmetry** which is important for maximum motor efficiency.

Connection / Navigation

Illustration 1: The Motolyser front panel has four touch buttons and a swipe wheel. The buttons are used for menu navigation UPP / DOWN and ENTER / EXIT. The swipe wheel is used for INCREASE / DECREASE in some menus. All the motor and power connections are easilly accessed on one side and the USB port on the other.

The Motolyser is navigated using the built-in touch panel consisting of four buttons and a swipe wheel. The buttons are used for navigating the menus while the wheel is used for increasing and decreasing motor speed in some tests. All connections are easily accessed from the side. The Motolyser is powered by 1 to 4-cell Li-Po battery connected to the +/- respectively. In case of wrong polarity the LED to the right of the display will light up.
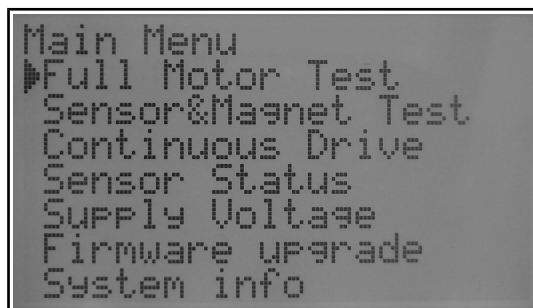
Quick Start:

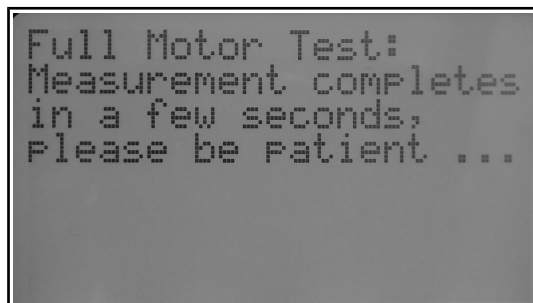(1) Connect the **phase cables** (A, B, C) and **sensor cable** to the motor
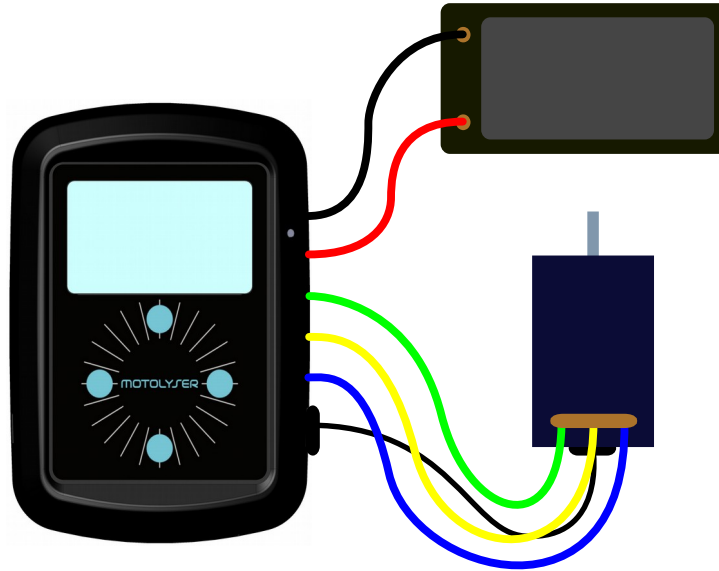
(2) Connect the **power cables** to the battery (1 to 4-cell Li-Po)

(3) Select test mode *Full Motor Test* or *Sensor & Magnet Test* by tapping UP or DOWN


```
Main Menu
▶Full Motor Test
 Sensor&Magnet Test
 Continuous Drive
 Sensor Status
 Supply Voltage
 Firmware upgrade
 System info
```

(4) Tap the ENTER button to start the test, a splash screen will be shown


```
Full Motor Test:
Measurement completes
in a few seconds,
please be patient ...
```

(5) When the test is completed, step among the result screens with the UP/DOWN
buttons, or EXIT to go back to main menu

Main Menu

To navigate in the menus and to start the motor the touch buttons are used. There are four buttons integrated that are used for navigating the menus. Tap ENTER to select an item and EXIT to go back to main menu.
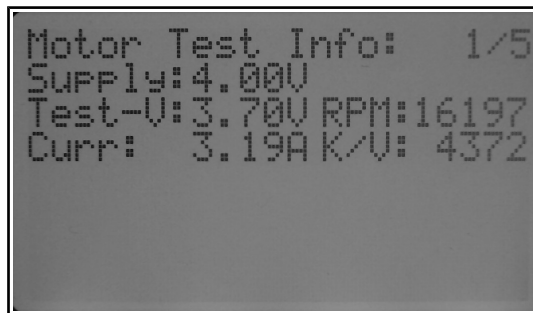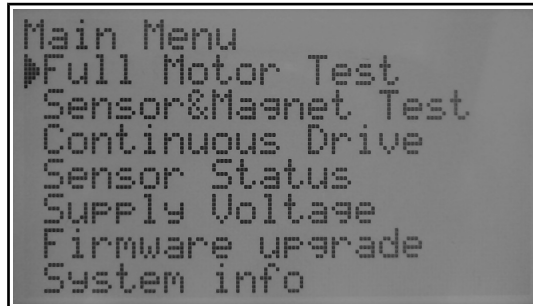

Full Motor Test: Starts a quick test for measuring how the motor operates when running with end-bell timing.

Sensor&Magnet Test: This test is used for measuring sensor and magnet condition only. It allows you to swipe the motor speed up and down using touch wheel.

Continuous Drive: Runs the motor continuously using the sensor. Swiping the
wheel will increase /decrease motor speed. RPM is limited to 15000.

Sensor Status: Shows the status of each sensor high/low. This is useful to check for proper operation and possible sensor glitches.

Supply Voltage: Shows the supply voltage.

Firmware Upgrade: Enters the firmware upgrade mode, for connection to the PC upgrade application using the USB port.

System Info: Displays the hardware version, manufacturing date, and firmware version.

Full Motor Test
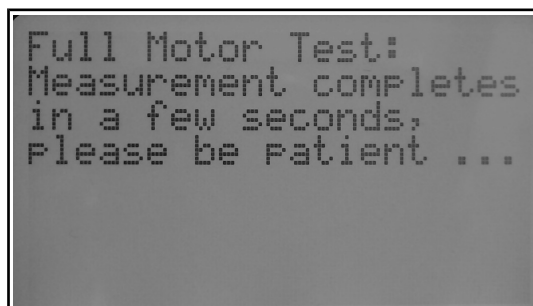
When the Full Test is selected in the main menu and the ENTER button is tapped the test will start. As the Full Motor Test is running, a splash screen is shown until the test is completed. Afterwards the results from the test will be presented over several pages. In the upper right corner a page count is shown.
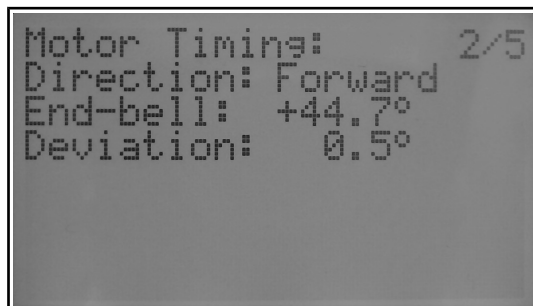
Motor Test Info

```
Motor Test Info:    1/5
Supply:4.00V
Test-V:3.70V RPM:16197
Curr:   3.19A K/V: 4372
```

Supply: Battery supply voltage
Test-V: Test voltage
Curr: Current drawn from the battery
RPM: Motor rotational speed
K/V: The speed to voltage ratio, compensated for duty-cycle
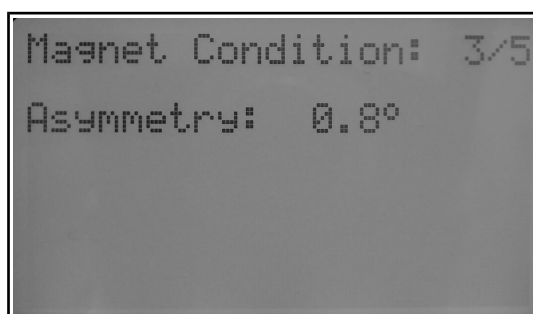
Motor Timing

```
Motor Timing:       2/5
Direction: Forward
End-bell:   +44.7°
Deviation:    0.5°
```

Direction: Indicates the rotating direction of the motor
End-Bell: The average timing advanced of the motor end-bell
Deviation: Sensor element deviation, how well aligned the sensor elements are aligned.

Magnet Condition

```
Magnet Condition:  3/5

Asymmetry:   0.8°
```

The magnet asymmetry is the deviation from an ideal magnet with identical sized
sectors for magnet North and South poles. In the ideal case each pole occupy half
the rotor, resulting in a sector of 180 degrees for each pole. However, this is often
not the case due to manufacturing tolerances. A perfect magnet with ideal sectors
would result in an Asymmetry of 0.

Sensor Angles

```
Sensor Angles:      4/5

  PhA       PhB       PhC
+45.3°    +44.7°    +44.0°
```
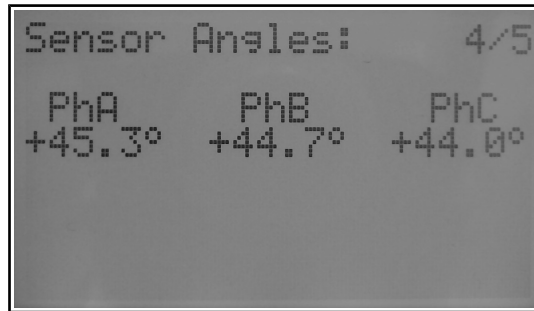
This menu show the actual timing for each of the three sensor elements. Smaller difference between these values makes a good sensor. All motor manufacturers have tolerances in the production and the resulting alignment depend on production batch and how well the chip is aligned on the PCB. It is also important how the sensor board is mounted inside the motor since the trigger point is dependent on the distance to the rotor.

Phase Currents

```
Phase Currents:     5/5

  PhA       PhB       PhC
 6.16A     6.29A     6.40A
```
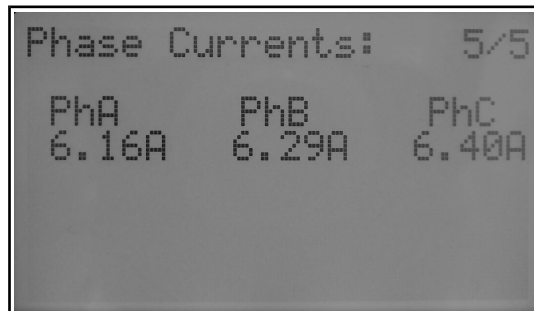
Display the true RMS current for each phase. A balanced motor will show similar values on all three phases. If these values are off, it may indicate that the stator is in bad shape or something is causing the current not to flow the correct path, conductive dirt etc.

Sensor&Magnet Test

When the motor is started you will be directed directly to screens displaying the test information. The motor is tested continuously and you can swipe the wheel to increase (CW) or decrease (CCW) the motor speed. In this mode there is a motor speed limit of 15000 RPM. Step among the data pages with the UP/DOWN buttons. The pages are a limited set of the ones earlier described in Full Motor Test.

Continuous Drive

This mode drives the motor continuously using the sensor. The RPM limit is set to 15000 in order not to ruin motor when freewheeling. The motor speed is set by swiping the wheel CW to increase and CCW to decrease. Step among the data pages with the UP/DOWN buttons. The pages are a limited set of the ones earlier described in *Full Motor Test.*

Sensor Status


```
Sensor Status
  ●        O        ●
  A        B        C
▶Sensor Status
 Supply Voltage
 Firmware upgrade
 System info
```
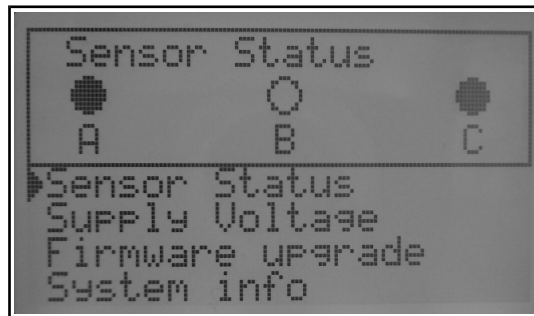
An easy method for finding out if the sensor is operating correctly is to use the Sensor Status check. The test checks the signals from the sensor and indicates high and low in the circles. Make sure all the signals toggle when you rotate the motor shaft.

Supply Voltage


```
Supply Voltage
      3.83V
 Sensor Status
▶Supply Voltage
 Firmware upgrade
 System info
```
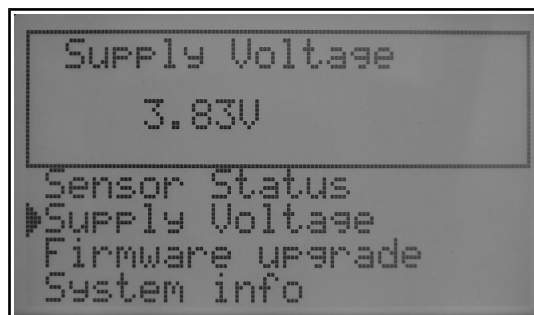
To see the supply voltage this menu is useful. As you can see the connected battery is not fully charged.

System Information


```
    System Info
Serial: 243B0003
Date: 2018-04-28
Build: v2.1-171-9d0bf
```
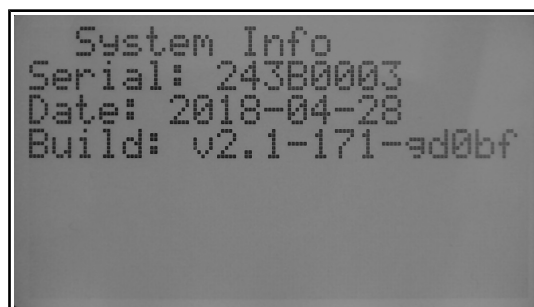
Serial: Serial number of the device.
Date: Production date.
Build: Current firmware build running in the device.
This information is important to provide in cases of contact with support or discussing features with others. The build string contain different parts broken up into v(version)-(build)-(hash).

Firmware upgrade

1. Locate a micro USB cable that will fit the USB port on the Motolyser and your PC
2. Download the Motolyser Upgrade Tool and install as administrator
   on your PC (Currently Windows only). The latest firmware is stored in the *firmware* folder of your install directory
3. Start the Motolyser Upgrade Tool
4. Select the downloaded ".mot" file using the menu choice, File->Open
5. Connect USB cable to USB port on your PC.
6. **If you are running build #114 or higher** plug the USB cable in the Motolyser and navigate to "Firmware Upgrade" in Main Menu and press ENTER, jump to step 11**. Otherwise continue with step 8.**

```
Upgrade Mode:
Please connect USB
cable and start the
PC application
```
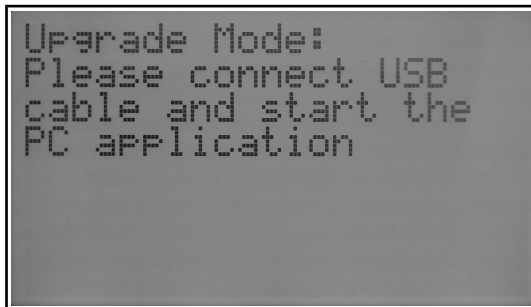
7. Place Motolyser on its side with connectors upwards with *NO* cables attached.
8. Push the "upgrade" button on the Motolyser with a toothpick, match or similar non conductive gadget.
9. While still holding the button, attach USB cable to the USB port on the Motolyser.
10. Display should start flashing, indicating it's ready to receive new firmware.
    If back-light does not blink, please go back to step 6.

11. You may be prompted to install a driver for the Motolyser at this time.
    Select appropriate choices in the wizards window to install driver automatically.
12. The Motolyser Upgrade Tool software should now indicate that the Motolyser has been recognized [Device Detected in the bottom right corner of the status-bar]
13. Click the button" Upgrade Firmware".
14. When the Motolyser restarts, You are done!

Error Codes

Over Temperature:
> The system is overheated. Please let it cool down for a while restart the motor. Please note that for motors with less than 8.5 turn it is recommended to use 1-cell Li-Po supply. Also, higher timing causes the Motolyser to heat up more

Sensor Sync Error:
> The sensor signal is out of sequence. This may be caused by a bad cable, glitch, or faulty sensor. Please check the wires and connections. Another reason is very high timing (+50degrees) or high rotor asymmetry. Bothe of these cases can cause the motor to start in reverse direction and that will be detected as an error

Can not start the motor:
> An error during motor start up. This can be caused by incorrect wiring of motor cables or bad contact of the phase current cables. Check wiring and retry starting the motor.

Low Supply voltage:
> Your battery is running low. Either your battery needs charging or there is a bad connection to the battery, causing a voltage drop in the wire connections

FAQ

Timing setting on the end-bell have no impact on motor RPM
If you are running build prior to #114, please upgrade to the latest firmware and run the "Current Test".

The Motolyser does not show the same K/V value as the manufacturer claims
The K/V value is dependent of many things related to the conditions under which the motor is running. Factors such as timing advance, strength of magnetic field and friction all play an important role in the resulting K/V.

Contact

If you have any questions or recommendations please drop us a note at info@motolyser.com. Also, please frequently visit our homepage (www.motolyser.com) where information about new features and user stories will be posted.

At our Motolyser User Suggestions portal you can make your voice heard. This is where you can vote for new features, post ideas or listen to what other users think. In our Knowledge Base we post articles about how to get the most out of our Motolyser.