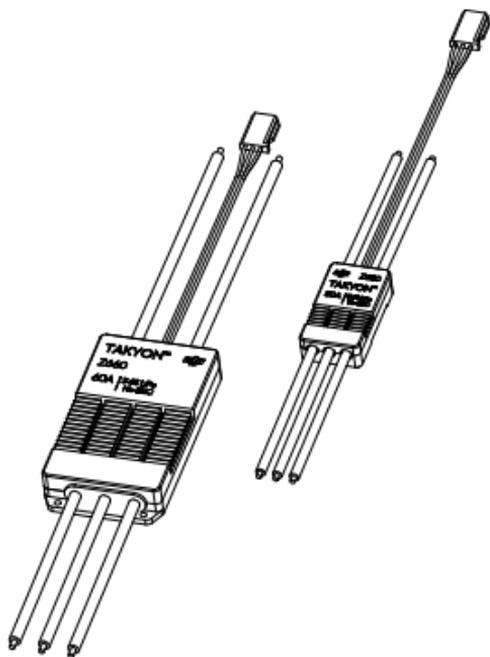# TAKYON Z650 / Z660

Electronic Speed Controller

User Manual (V1.0)

2017.02

djı

Searching for Keywords

Search for keywords such as "battery" and "install" to find a topic. If you are using Adobe Acrobat Reader to read this document, press Ctrl+F on Windows or Command+F on Mac to begin a search.

Navigating to a Topic

View a complete list of topics in the table of contents. Click on a topic to navigate to that section.

Printing this Document

This document supports high resolution printing.

Contents

Disclaimer

Thank you for purchasing the TAKYON™ Z650 / Z660 Electronic Speed Controller (hereinafter referred to as "product"). Read this disclaimer carefully before using the product. By using this product, you hereby agree to this disclaimer and signify that you have read it fully. Please use this product in strict accordance with this document. SZ DJI TECHNOLOGY CO., LTD. and its affiliated companies assume no liability for damage(s) or injuries incurred directly or indirectly from using or refitting this product improperly.

DJI™ is a trademark of SZ DJI TECHNOLOGY CO., LTD. (abbreviated as "DJI") and its affiliated companies. Names of products, brands, etc., appearing in this document are trademarks or registered trademarks of their respective owner companies. This product and document are copyrighted by DJI with all rights reserved. No part of this product or document shall be reproduced in any form without prior written consent of or authorization from DJI.

This disclaimer is produced in various languages. In the event of variance among different versions, the Simplified Chinese version shall prevail when the product in question is purchased in China, and the English version shall prevail when the product in question is purchased in any other region.

Warning

1. Always attempt to fly your aircraft in areas free of people, animals, power lines, and other obstacles.
2. DO NOT approach or touch the motors or propellers when the unit is powered on.
3. Be sure to use the product in strict accordance with the specifications (voltage, current, temperature, etc.) listed in this document. Failure to do so may result in permanent damage to the product.
4. The input throttle signal mode (regular or OneShot125) cannot be changed while the product is in use. Set the input throttle signal mode on your flight controller. Restart the electronic speed controller to apply the new mode.
5. Ensure that there are no open circuits or short circuits when soldering the power cables.
6. Before takeoff, ensure that the propellers and motors are installed correctly.
7. Ensure that all parts of the aircraft are in good condition. DO NOT fly with worn or damaged parts.
8. Ensure that all parts are firmly in place and all screws are tight before each flight.

Legend

⚠ Important   ☼ Hints and Tips   ▤ Reference

If you encounter any problems or if you have any questions, please contact your local DJI authorized dealer or DJI Support.

DJI Support Website:

http://www.dji.com/support

Download the latest version of this manual from:

http://www.dji.com/takyon-z650

http://www.dji.com/takyon-z660

Visit the official DJI Forum for more topics:

http://forum.dji.com

Visit the DJI Online Store for more related products:

http://store.dji.com

For details on our after-sales policy, visit: **http://www.dji.com/service**. If you are unable to view the webpage or would like to request a hard copy of our policy, please contact your local DJI branch office or authorized dealer.

Profile

The Takyon Z650 / Z660 Electronic Speed Controller (ESC) uses a DJI developed 32-bit motor driver with an integrated circuit. It is capable of a maximum main frequency of 100 MHz, and a maximum output PWM frequency of 48 kHz. A built-in high-precision crystal oscillator achieves more precise and responsive control, and bypasses throttle range calibration. The stall protection function can stop ESC output, preventing damage from motor stalls. A high-level anti-static design ensures stable and reliable operation. The Takyon Z660 ESC's sealed (IP67 rated, IEC standard 60529) shell protects against dust and liquid, making it ideal for industrial applications such as agriculture, surveying and mapping, loss prevention, crime prevention and patrol.

DJI ASSISTANT™ 2 allows you to configure the timing, acceleration, active braking, motor rotation direction and other parameters. Built-in configurations, specifically for different propellers and applications, can be selected to minimize setup time and risk. Upgradable firmware ensures the Takyon series stays up-to-date with DJI's latest motor control technology and features.

Features

Active Braking Function

Broad Motor Compatibility*

Adjustable Output PWM Frequency

Batteries: 3S-6S LiPo

* Refer to Specifications (p. 13) for details.

Maximum Continuous Current: 50 A (Z650) or 60 A (Z660)

High Rotational Speed Motors

• 40,000 rpm (7 pole pairs)   • 280,000 rpm (1 pole pair)

Two Throttle Signal Modes

• Regular throttle signal: 30 Hz to 500 Hz PWM signal

• OneShot125 signal: 30 Hz to 650 Hz

PC Assistant Software

• Timing settings   • Active braking settings

• Startup tone settings   • Motor rotation direction settings

• Acceleration settings   • Motor rotation direction testing

• Throttle range settings   • Output PWM frequency settings

• Firmware upgrade

Complete Electromagnetic Compatibility Test

• Radiated emission   • Electrostatic discharge immunity

• Radiated RF electromagnetic field immunity

Typical Applications

• Z650: Racing drones, camera drones

• Z660: Industrial multirotor aircraft

Active Braking: The motor actively provides a reverse torque when decelerating, recovering some of the rotational energy. Normal braking mainly relies on air resistance.

⚠ DO NOT use a direct-current power supply for testing to avoid damage to the ESC and power supply when active braking function is enabled.

Connection

Tools Required: Power distribution board (PDB)*, electric soldering iron and soldering tin

1. Solder the ESC's black and gray power cables to the pads on the PDB.

Signal Cable (To flight controller)

Power Cables (Gray for Positive, Black for Negative)
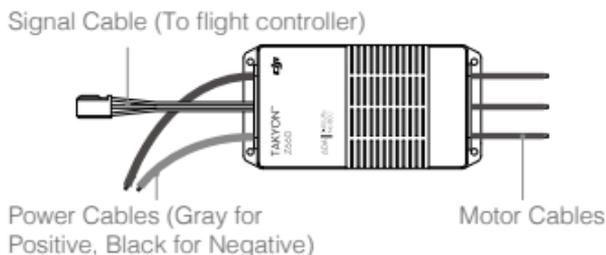
Motor Cables

2. Connect the signal cable to your flight controller. The signal cable's white wire transmits the control signal; the gray wire transmits the data signal; the black wire is for ground.
3. Connect the motor to the ESC.

⚠ Ensure that there are no open circuits or short circuits when soldering the ESC cables.

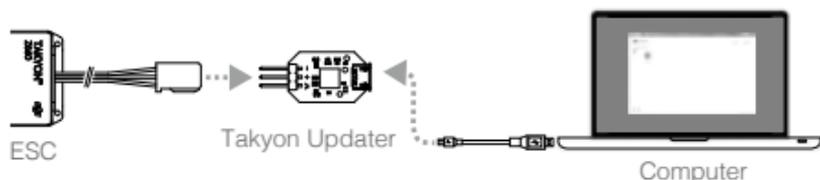☼ It is recommended that you solder a power connector on the PDB for the battery.

* Use a PDB which has sufficient trace spacing and current capacity, according to the number of ESCs and the battery voltage.

Using DJI Assistant 2

DJI Assistant 2 is used to upgrade and configure the ESC.

⚠ • The DJI Takyon Updater is required but is not included with the ESC. To use DJI Assistant 2, connect the ESC to a computer through the DJI Takyon Updater as shown below.
   • To ensure your own safety, remove the propellers or disconnect the ESC and motors before using DJI Assistant 2.
   • Unplug any other serial devices that are connected to your computer before using the DJI Takyon Updater.

ESC   Takyon Updater

Computer

1. Download and install DJI Assistant 2 from the official DJI website.
   http://www.dji.com/takyon-z650/info#downloads
   http://www.dji.com/takyon-z660/info#downloads
2. Connect the Takyon Updater to the ESC with the signal cable and to your computer with a Micro USB cable. The signal cable's white wire transmits the control signal (⎍); the red wire transmits the data signal (+); the black wire is for ground (-). DO NOT reverse the signal cable.
3. Connect a battery (3S - 6S LiPo) to supply power to the ESC. Do not disconnect the ESC from your computer or the power supply until configuration is complete.
4. Launch DJI Assistant 2. When a connection is established, the software will display the connected devices.

5. Click the device name ⬛ under "Connected Devices" to enter the settings page and configure the ESC. Click the Settings tab for basic settings such as Active Braking, Timing, Motor Rotation, Startup Tone, Throttle Range, etc. Click the Advanced Settings tab for Output PWM Frequency Settings.

6. Click ⬇ on the top left corner of "Connected Devices" to enter the firmware upgrade page. Check the current firmware version and ensure the installed firmware is up-to-date. If not, login with your DJI account and click the Upgrade button.

⚠ If your ESC is not recognized by DJI Assistant 2 (no connected devices):

- Check if there is more than one FTDI device connected such as another DJI Takyon Updater, a DJI Updater, an FTDI USB adapter or development board (e.g. a BeagleBone, Raspberry or Arduino board). Unplug the other FTDI devices, restart the ESC and DJI Assistant 2, and try again.
- Re-connect the ESC and the power supply in the following order: Connect the ESC to your computer, connect the power supply to the ESC, and then launch DJI Assistant 2.

Using the Remote Controller for ESC Configuration

⚠ Be sure to remove the propellers before configuring the ESC.

If your ESC is in the regular input throttle signal mode, calibrate the throttle range and switch the motor rotation direction using the remote controller.

1. Power on the remote controller and receiver. Ensure a good communication between them.
2. Push the throttle stick all the way up, connect the ESC to the motor and power on the ESC. The motor will start beeping, alternating between a double beep and a triple beep with a two-second gap between each beep. To configure the ESC, carry out each of the following movements within the two-second gap.
   a. Throttle Range Calibration
      After the double beep, pull the throttle stick all the way down. A 1-second beep will sound if calibration is complete.
   b. Motor Rotation Direction Switch
      After the triple beep, pull the throttle stick all the way down. A 1-second beep will sound once motor rotation direction has been switched.

System Status Beep Codes

You can instantly tell the system's status by observing the emitted sounds from the motor.

Normal	Description
Startup Tone ♪	System ready.
Abnormal	Description
Rapid Beeping	Starting input signal is not at minimum. Check the settings of your flight controller, receiver and remote controller.
Slow Beeping	No signal input.
Alternating Double and Triple Beeps	Using the remote controller for configuration.

Specifications

Parameters	Z650	Z660	Unit
Max Allowable Voltage	26.1	26.1	V
Max Allowable Current* (Continuous)	50	60	A
Max Peak Current (< 3 sec)	60	70	A
Max OneShot125 Signal Frequency	650	650	Hz
Max Regular Signal Frequency	500	500	Hz
Defaulted Output PWM Frequency	16	16	kHz
Weight (Without Cable)	10	50	g
Battery	3S - 6S LiPo		
Operating Temperature	-10° to 40° C (14° to 104° F)		
Compatible Motor Models	Include but not limited to: 1306, 1804, 1806, 2216, 2312, 3510, 3512, 3515, 3520, 4010, 4114, 4216, 5010, 6215		

* Data measured in ventilated environment and at a temperature of 25° C.

Extreme Operating Environment

Unless specified, the data below was measured with an input voltage of 22.2 V, and at a temperature of 25℃.

Parameters	Z650		Z660		Unit
	Min	Max	Min	Max	
Input Voltage	9.6	26.1	9.6	26.1	V
Allowable Current (Continuous)	-	50	-	60	A
Peak Current (< 3 sec)	-	60	-	70	A
PWM Input Signal Level	3.0	5.0	3.0	5.0	V
Oneshot125 Signal Frequency	30	650	30	650	Hz
Regular Signal Frequency	30	500	30	500	Hz
Operating Temperature	-10	50	-10	50	℃

Recommended Operating Environment

Parameters	Z650			Z660			Unit
	Min	Typ	Max	Min	Typ	Max	
Input Voltage	9.6	22.2	26.1	9.6	22.2	26.1	V
PWM Input Signal Level	3.3	-	5.0	3.3	-	5.0	V
Oneshot125 Signal Frequency	30	-	650	30	-	650	Hz
Regular Signal Frequency	30	-	500	30	-	500	Hz
Operating Temperature	-10	25	40	-10	25	40	℃

Typical Environment Characteristics

Unless specified, the data below was measured with an input voltage of 11.1 V, and at a temperature of 25℃.

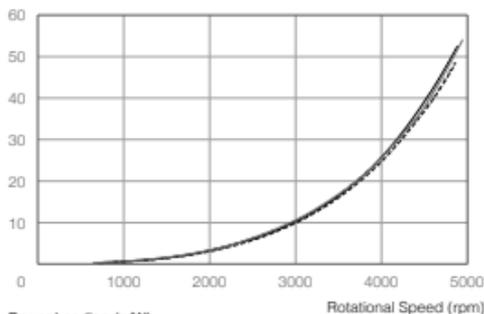| Parameters	Z650			Z660			Unit
	Min	Typ	Max	Min	Typ	Max	
Quiescent Current	0.0221	0.0227	0.0235	0.0175	0.0181	0.0187	A
Current at Full Throttle*	47.394	50.137	53.469	51.066	53.680	56.294	A
ESC Temperature When Hovering**	-	30.4	-	-	30.4	-	℃

Test Environment:

* Propeller: 2255; Motor: 6215 (KV350)

** Frame: diagonal wheelbase, 600 mm; Propeller: 1345; Motor: 3510 (KV350); Battery: 6S LiPo, 4500 mAh; Total quadcopter weight: 1866 g (Z650) / 2010 g (Z660)
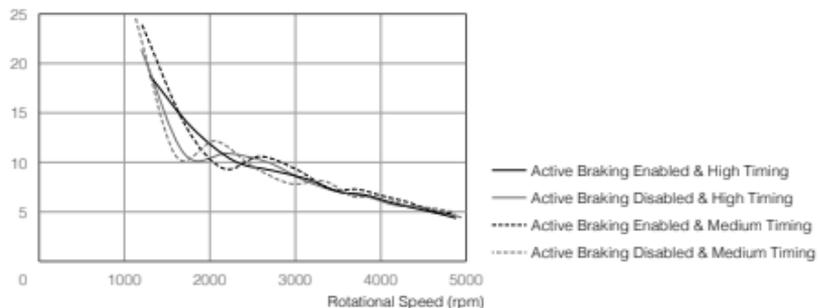
Performance Diagram

Z650

Data measured using 5010 (KV288) motor and 1855 propeller with an input voltage of 22.2 V, and at a temperature of 25°C.


The maximum rotational speed in the diagrams above corresponds to the power loading as shown in the table below:

| Parameters	Active Braking Enabled & High Timing	Active Braking Disabled & High Timing	Active Braking Enabled & Medium Timing	Active Braking Disabled & Medium Timing
Rotational Speed (rpm)	4884	4945	4865	4852
Power Loading (g/w)	4.367	4.433	4.787	4.990

Z660

Data measured using 6215 (KV350) motor and 2255 propeller with an input voltage of 22.2 V, and at a temperature of 25°C.
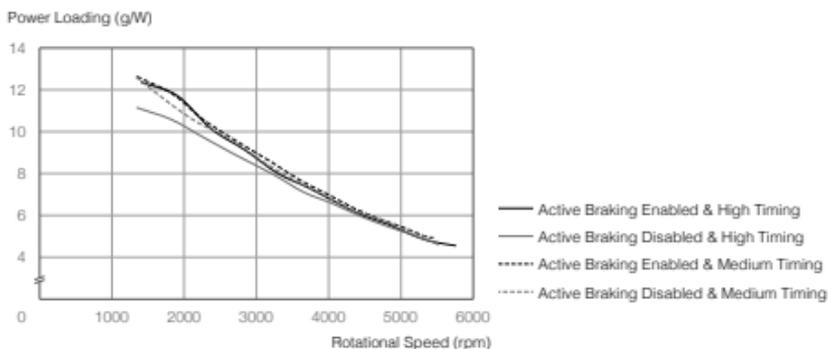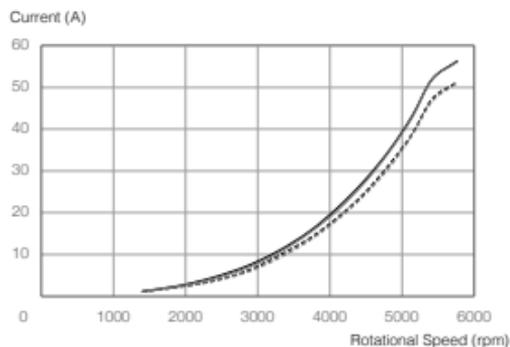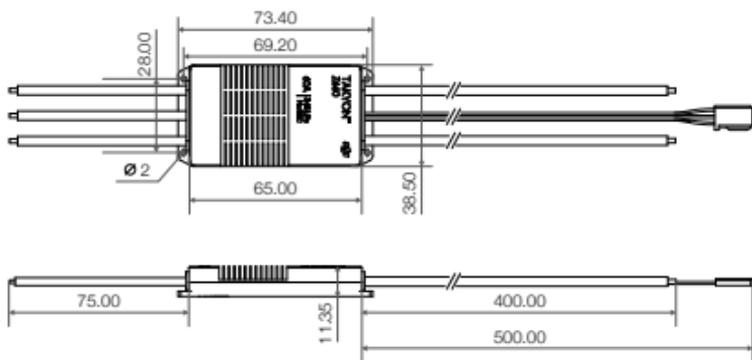
Current (A)

Power Loading (g/W)

Parameters	Active Braking Enabled & High Timing	Active Braking Disabled & High Timing	Active Braking Enabled & Medium Timing	Active Braking Disabled & Medium Timing
Rotational Speed (rpm)	5764	5524	5451	5421
Power Loading (g/w)	4.554	4.587	4.936	4.871

ESC Dimensions

Z650
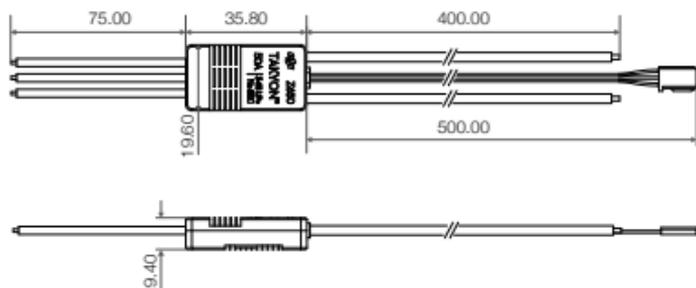
Z660

Unit: mm

DJI Support
http://www.dji.com/support

This content is subject to change.

Download the latest version from
http://www.dji.com/takyon-z650
http://www.dji.com/takyon-z660

If you have any questions about this document, please contact
DJI by sending a message to **DocSupport@dji.com**.