

# TAKYON

## Z318 / Z420 Electronic Speed Controller

User Manual V1.0

2016.03



## **Disclaimer**

Thank you for purchasing the TAKYON Z318 / Z420 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 install and use this product in strict accordance with the User Manual. SZ DJI Technology Co., Ltd. and its affiliated companies assume no liability for damage(s) or injuries incurred directly or indirectly from using, installing or refitting this product improperly, including but not limited to using non-designated accessories.

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

## Warning

When powered on, the motors and propellers will rotate very quickly and can cause serious damage or injuries. Always maintain caution and make safety your top priority.

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 manual. 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.

## Legends



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/product/takyon-z318-and-z420>

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>

## Features

Active Braking Function

Excellent Motor Compatibility

Batteries: 2S - 3S LiPo (Z318) or 2S - 4S LiPo (Z420)

Maximum Continuous Current: 18 A (Z318) or 20 A (Z420)

Two Throttle Signal Modes

- Regular throttle signal: 30 Hz to 500 Hz PWM signal
- OneShot125 signal: 30 Hz to 600 Hz

High Rotational Speed Motors

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

PC Assistant Software

- Timing settings
- Active braking settings
- Acceleration settings
- Motor rotation direction settings
- Startup tone settings
- Throttle range settings
- Firmware upgrade

Complete Electromagnetic Compatibility Test

- Radiated emission
- Electrostatic discharge immunity
- Radiated RF electromagnetic field immunity

Typical Applications

- Racing drones
- Camera drones



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

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**DO NOT** use a direct-current power supply for testing to avoid damage to the electronic speed controller and power supply when active braking function is enabled.

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## Profile

The TAKYON series Electronic Speed Controller (ESC) uses a high performance motor driver integrated circuit developed by DJI with a maximum main frequency of 100 MHz. The IP core design replaces complex coding with dedicated hardware, combined with advanced stator flux observer technology, to attain precise changes in motor direction and acceleration while maximizing square-wave drive performance. Compared with products using square-wave drive of zero-crossing detection, the Z318 and Z420 achieve better motor efficiency. In addition, they automatically adapt to motor characteristics for optimized stability and control.

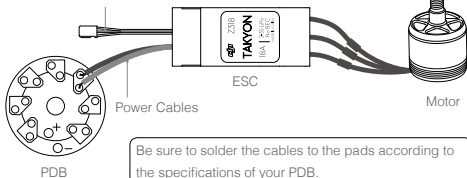
DJI Assistant 2 allows you to configure the timing, acceleration, active braking, motor rotation direction and other parameters. Built-in configurations, specifically for different propellers and applications, can be selected to minimize setup time and risk. Upgradable firmware ensures the TAKYON series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

## Connection

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

1. Solder the ESC's black and red power cables to the pads on the PDB as shown.
2. Connect the signal cable to your flight controller. The signal cable's white wire transmits the control signal; the red wire transmits the data signal; the black wire is for ground.
3. Connect the motor to the ESC.

Signal Cable (To flight controller)



Be sure to solder the cables to the pads according to the specifications of your PDB.

The PDB in the figure uses its outer pads for the black cables, and the inner pads for the red cables. Cut the cables to length. The cables should not be so long as to bunch up near the solder point.



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.

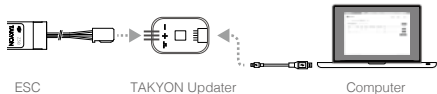
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## Using DJI Assistant 2

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.
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1. Download and install DJI Assistant 2 from the official DJI website.
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 ( $\perp$ ); the red wire transmits the data signal (+); the black wire is for ground (-). DO NOT reverse the signal cable.
3. Connect a battery (2S - 3S LiPo for Z318 or 2S - 4S LiPo for Z420) 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.

**Active Braking:** Enable or Disable


**Acceleration:** Between 1 and 100


**Timing:** Medium or High

**Motor Rotation Direction:** Clockwise or Counter-clockwise

**Startup Tone:** DJI (🎵 1356), Simple (🎵 1) or Mute (not recommended)

**Throttle Range:** Min Range (500-1400), Max Range (1600-2200); for regular input throttle signal mode only.

Click  on the right side of the software interface for more details about the parameters.

6. Click  on the top left corner of "Connected Devices" to enter the firmware update 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.
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## Using the Remote Controller for ESC Configuration

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Be sure to remove the propellers before configuring the ESC.

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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.

### Sound Description

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 Beep	Starting input signal is not at minimum. Check the settings of your flight controller, receiver and remote controller.
Slow Beep	No signal input.
Alternating Double and Triple Beep	Using the remote controller for configuration.

## Specifications

Parameters	Z318	Z420	Unit
Max Allowable Voltage	13.05	17.4	V
Max Allowable Current* (Continuous)	18	20	A
Max Peak Current (< 3 sec)	25	30	A
Max OneShot125 Signal Frequency	600	600	Hz
Max Regular Signal Frequency	500	500	Hz
PWM Switching Frequency	16	16	kHz
Weight	13	13.2	g
Battery	2S - 3S LiPo	2S - 4S LiPo	-
Operating Temperature	-10 to 40	-10 to 40	°C

\*The data was measured in ventilated environment and at room temperature.

## Extreme Operating Environment

Unless specified, the data below was measured with an input voltage of 11.1 V (Z318) or 14.8 V (Z420), and at room temperature.

Parameters	Z318		Z420		Unit
	Min	Max	Min	Max	
Input Voltage	6.4	13.05	6.4	17.4	V
Allowable Current (Continuous)	-	18	-	20	A
Peak Current (< 3 sec)	-	25	-	30	A
PWM Input Signal Level	3.0	5.0	3.0	5.0	V
Oneshot125 Signal Frequency	30	600	30	600	Hz
Regular Signal Frequency	30	500	30	500	Hz
Operating Temperature	-10	50	-10	50	°C

## Recommended Operating Environment

Parameters	Z318			Z420			Unit
	Min	Typ	Max	Min	Typ	Max	
Input Voltage	7.4	11.1	13.05	7.4	14.8	17.4	V
PWM Input Signal Level	3.3	-	5.0	3.3	-	5.0	V
Oneshot125 Signal Frequency	30	-	600	30	-	600	Hz
Regular Signal Frequency	30	-	500	30	-	500	Hz
Operating Temperature	-10	25	40	-10	25	40	°C

## Typical Environment Characteristics

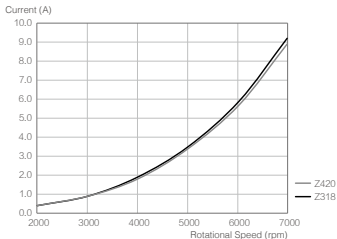
Unless specified, the data below was measured with an input voltage of 11.1 V (Z318) or 14.8 V (Z420), and at room temperature.

Parameters	Test Environment	Z318			Z420			Unit
		Min	Typ	Max	Min	Typ	Max	
Quiescent Current	-	0.0255	0.0258	0.0260	0.0243	0.0244	0.0246	A
Current at Full Throttle	Propeller: DJI Z-Blade 9450  Motor: DJI 2312E (960KV)	7.709	7.753	7.834	11.323	11.423	11.509	A
ESC Temperature When Hovering	Frame: DJI F450  Propeller: DJI Z-Blade 9450  Motor: DJI 2312E (960KV)  Battery: 4S LiPo, 2600 mAh (Z420)  3S LiPo, 2600 mAh (Z318)	-	39.2	-	-	43.4	-	°C

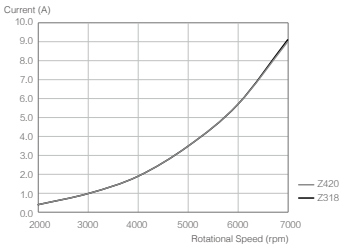
## Performance Diagram

The data below was measured using the DJI 2312E (960KV) motor and DJI Z-Blade 9450 propeller, set at High timing, and at room temperature.

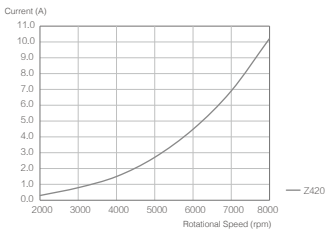
1. Input voltage of 11.1 V, Active Braking enabled.



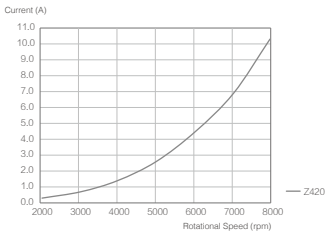
2. Input voltage of 11.1 V, Active Braking disabled.



3. Input voltage of 14.8 V, Active Braking enabled.

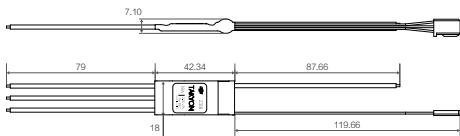


4. Input voltage of 14.8 V, Active Braking disabled.

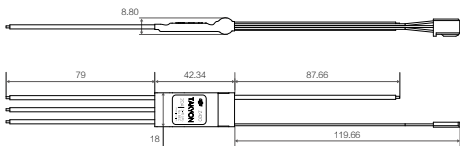


## ESC Dimensions

### Z318



### Z420



Unit: mm

## Compatible Motor Models

The Z318 and Z420 are compatible with motors (including but not limited to):  
1804, 1806, 2204, 2206, 2208, 2212, 2216, 2312, 2808, 3506



## Compliance Information

Comply with the FCC, CE and RoHS rules.

### FCC Warning

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

### CE Warning

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

**EU Compliance Statement:** SZ DJI TECHNOLOGY CO., LTD. hereby declares that this device is in compliance with the essential requirements and other relevant provisions of the EMC Directive.

A copy of the EU Declaration of Conformity is available online at [www.dji.com/euro-compliance](http://www.dji.com/euro-compliance)



EU contact address: DJI GmbH, Industrie Strasse. 12, 97618, Niederlauer, Germany

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

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