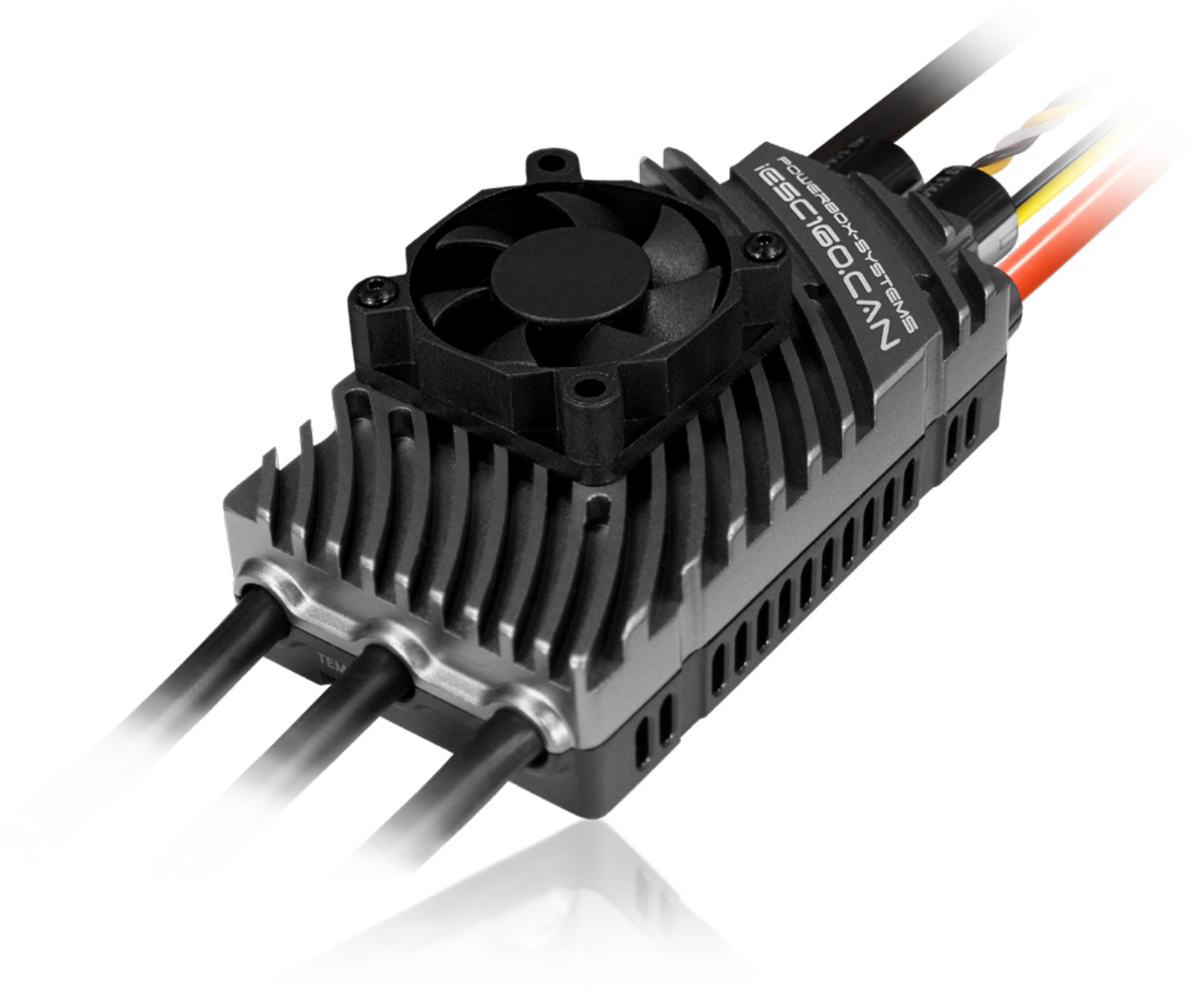
INSTRUCTION MANUAL

PowerBox Systems®
Industrial



iESC 160.CAN

Intelligent 32-Bit Brushless Speed Controller with telemetry

Dear PowerBox customer,

Congratulations on your **new PowerBox iESC brushless speed controller**. The **iESC** is based on the latest generation of controllers for brushless motors, featuring a 32-bit processor and extended functions such as telemetry and direct adjustment from the transmitter. The powerful microprocessor ensures clean motor running for brushless motors with up to 40 poles.

Braking force, motor timing, direction of rotation, gear ratio, freewheeling, heli mode and much more can be set via the CAN bus. A simple **iESC** programming box (Order no. 5115) is also available for system-independent programming.

The **iESC 160.CAN** provides Ardupilot compatible telemetry data such as battery voltage, current, used capacity, RPM and the temperature of the controller. Other protocols are available on request.

The **iESC 160.CAN** works with up to 14S batteries and is designed as an opto version.

Features:

+ High performance brushless controller with 32-bit technology
+ Latest MosFet generation for less power loss and highest reliability
+ Telemetry plug'n'play for Ardupilot
+ Fixed-wing and heli mode
+ Adjustable direction of rotation, timing, battery type, freewheeling, starting current and other parameters
+ Adjustable control parameters in Governor mode
+ Parameters can be set directly via the CAN bus or the iESC programming box
+ Integrated anti-spark circuit
+ HV opto version
+ Self-test when switching on checks motor, throttle position and voltage
+ Optimum cooling thanks to sophisticated housing design

Specification:

Type	Current load cont. / peak	LiPo cells	Dimensions (mm)	Weight (g)	Adjustable parameters
iESC160.CAN	160A / 180A	6S-14S	97 x 51 x 34 mm	199 g	Yes

1. CONNECTIONS

Be sure to remove the propeller first! Connect the iESC to the motor first. You can change the direction of rotation by swapping two of the three cables – this can also be done easily via the CAN menu or the LCD programming box.

Set the throttle channel on the transmitter to -100 % to +100 % and prepare your flight computer for the use of a motor controller with CAN bus. The following is an example of the settings in the Mission Planner:

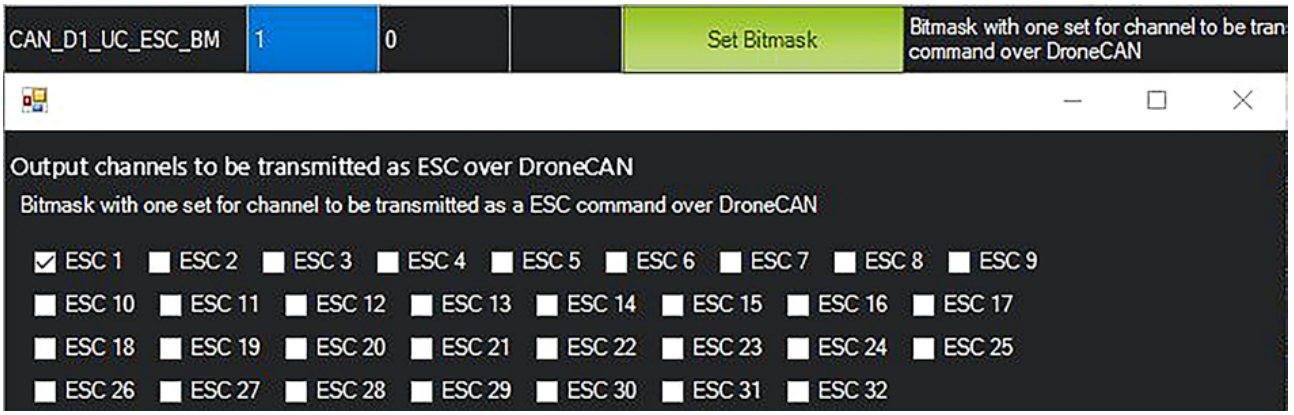
Set DroneCan as the protocol:

CAN_D1_PROTOCOL	1	1		DroneCAN	Enabling this option starts selected protocol that will use this virtual driver

Set the RC channel as in your remote control:

Komando	Wert	Default	Einheiten	Optionen	Desc	Fav
SERVO1_FUNCTION	51	4		RCIN1	Function assigned to this servo. Setting this to Disabled(0) will setup this output for control by auto missions or MAVLink servo set commands.	
SERVO1_MAX	1900	1900	PWM	800 2200	maximum PWM pulse width in microseconds. Typically 1000 is lower limit, 1500 is neutral and 2000 is upper limit.	
SERVO1_MIN	1100	1100	PWM	800 2200	minimum PWM pulse width in microseconds. Typically 1000 is lower limit, 1500 is neutral and 2000 is upper limit.	
SERVO1_REVERSED	0	0		0:Normal 1:Reversed	Reverse servo operation. Set to 0 for normal operation. Set to 1 to reverse this output channel.	
SERVO1_TRIM	1500	1500	PWM	800 2200	Trim PWM pulse width in microseconds. Typically 1000 is lower limit, 1500 is neutral and 2000 is upper limit.	

Set the output to ESC as in your remote control:



You will find the **iESC 160.CAN** in the overview:

The **iESC 160.CAN** has two Uni-connectors. One Uni-connector is for the CAN bus, the other with the yellow cable is for control via PWM.
If you want to realize control via CAN bus, do not connect the yellow cable.

The assignment on the CAN bus connector is as follows:

Black	GND
Yellow	CAN-H
White	CAN-L

Before you connect the drive battery:

Incorrect or negligent handling of an electric motor can lead to serious injuries, please observe the following **safety instructions**:

- Always remove the propeller from the motor when making adjustments to the iESC
- Ensure that the polarity of the drive battery is correct
- Use high-quality power connections that are designed for the corresponding load current.
- Keep the battery voltage within the permissible voltage/cell range.
- Ensure that the cable for the throttle channel is plugged into the correct slot
- Never attempt to load the motor with your hands
- As soon as the drive battery is connected, there is a risk of injury in the propeller area!

Now connect the drive battery. The **iESC 160.CAN** has an anti-flash circuit integrated in the electronics!
Wait until the beep sequence has run through.
If the controller continues to beep, the throttle channel is probably inverted. In this case, reverse the direction of the channel on the transmitter.
If the throttle channel is set correctly, the **iESC** confirms with the number of beeps how many Lipo cells have been recognized.

If the throttle setting is too high for starting, you can calibrate the throttle channel as follows:

- Remove the propeller from the motor!
- Switch on the receiver system and set the throttle stick to full throttle.
- Connect the drive battery to the **iESC** and wait 2 - 3 seconds.
- After you hear two short 'B-B' beeps, move the throttle stick to the idle throttle position.
- The **iESC** is now calibrated and will report the number of short beeps as battery cells are connected, followed by a long beep.
- The **iESC** is now ready for use.

2. STANDARD OPERATION

In normal operation, make sure that the throttle stick is in the **off position** and the flight computer is raised before plugging in the battery. When you connect the battery, the **iESC** acknowledges the number of cells connected with the number of beeps. Longer beeps stand for 5 or 10 cells, short beeps add more cells. Followed by a long beep, the **iESC** is now ready for use.

Please note:
Settings on the **iESC** via the CAN bus or LCD programming box are only saved when the engine is at a standstill.

3.TELEMETRY FUNCTION

The **iESC** offers a range of telemetry values. The following data is recorded in the iESC and transmitted via CAN-BUS:

- Battery voltage
- Current
- Speed (the pole speed and gear ratio of the motor can be adjusted)
- Temperature of the **iESC**

For example, the representation in the Mission Planner:

4. PARAMETER ADJUSTMENT

The **iESC** offers a range of setting options to adapt the **iESC** perfectly to the motor, battery and your personal preferences.

The settings can be made via CAN bus in the Mission Planner or with the separately available **iESC** programming box.

Komando	Wert	Min	Max	Default	Fav
Acceleration	1	0	3	1	
Battery Cells	0	0	9	0	
BaudDroneCAN	3	0	3	3	
BEC_Voltage	0	0	0	0	
Brake force	0	0	100	0	
Capacity Correction	8	0	16	8	
Cutoff_Type	0	0	1	0	
Cutoff_Volt	2	0	6	2	
Direction	0	0	1	0	
ESCMsgFreq	0	0	5	0	
Flighe Mode	0	0	1	0	
Freewheeling	0	0	1	0	
Gear 1	1	1	255	1	
Gear 2	1	1	255	1	
Gov_Param_I	4	0	9	4	
Gov_Param_P	4	0	9	4	
Motor Timing	15	0	30	15	
Pole Pairs	1	1	30	1	
pwmchannel	1	1	20	1	
Sensoraddress	57	0	255	57	
Startup Power	0	0	2	0	

Description of the adjustment parameters:

Parameter	Description	Adjustment range	Standard value
Brake power	The higher the value, the faster the motor stops.	0 % – 100 %	0 %
Motor Timing	Alters the control characteristics of the motor. Increasing this value can result in higher performance, but also leads to higher motor temperature. A lower value increases efficiency.	0° – 30°	15°
Direction	Reverses the direction of rotation of the motor.	0 / 1	0: CW

Gear 1 Gear 2	At this point enter the number of gear teeth of your gearbox, in order to obtain the rotational speed of the rotor or propeller.	1 - 255	
Freewheel	Synchronises motor speed with the throttle stick. A positive effect is faster throttle response. It also increases efficiency.	0 / 1	0
Cell count	Number of cells in the battery connected to the system. The Auto function very reliably detects the cell count. If this is not the case, e.g. if LiFe cells are used, you can enter the cell count manually.	0 – 9	0: AUTO 1: 6 cells 2: 7 cells ... 9: 14 cells
Power-off voltage	Defines the cut-off voltage per cell.	0 – 5	0: 2.5V 1: 3.0V 2: 3.2V 3: 3.4V 4: 3.6V 5: 3.8V
Power-off type	If a discharged battery is detected, the **iESC** can either switch the motor off immediately, or initially reduce maximum power to 70%.	0 / 1	0: Reduce 1: Switch off
Cap. correction	At this point you can enter a percentage value for correcting the capacity measurement, if the displayed value is different from the capacity actually consumed.	0 – 16	8
Acceleration	Defines how fast the motor's rotational speed increases.	0 – 3	1
Start-up power	Defines the current which is delivered to the motor when it starts up.	0 – 2	0: LOW 1: MIDDLE 2: HIGH

Flight Mode	Setting for fixed-wing model aircraft or helicopters. In fixed-wing mode the **iESC** starts at 5 % and increases **power** in proportion to the throttle stick position. In Heli mode the **iESC** starts at 40 %. From this point the motor speed rises slowly until it reaches the nominal point, after which **rotational speed** varies according to the throttle stick position.	0 / 1	0: Fixed Wing 1: Heli
Governor Parameter P	**Heli mode only!** Adjusts the governor parameter P (linear input). The higher the value, the **faster** the speed controller approaches the target speed. Too high a value results in overshooting.	0 – 9	5
Governor Parameter I	**Heli mode only!** Adjusts the governor parameter I (integral input). The higher the value, the **more accurately** the speed controller approaches the target speed. Too high a value results in over-shooting.	0 – 9	5
Pole pairs	This value is required in order to calculate the actual rotational speed of the propeller. The value is stated in the data sheet for your motor.	1 – 30	1
BaudDroneCAN	Baud rate CAN bus	0 – 3	0: 100 kbps 1: 250 kbps 2: 500 kbps 3: 1000 kbps
ESCMsgFreq	CAN bus frequency messages	0 – 3	0: 50 Hz 1: 20 Hz 2: 10 Hz 3: 1 Hz

5. SPEED CALIBRATION (only heli/governor mode!)

- Remove the rotor blades.
- Calibrate the throttle stick as described under 1.
  If you have already done this, go to the next point.
- Make sure that the pitch is set to 0°!
- Wait until the self-test is complete.
- Move the throttle stick to 50 %, the rotor will start slowly. The helicopter will not take off because the pitch is set to 0 %. As soon as the speed is stable, move the throttle stick back to minimum. The rotor brakes to a standstill.
- Calibration is complete.

6. GENERAL PROTECTIVE SYSTEMS

- **Start-up guard**
  If the motor does not start within 2 seconds, the **iESC** switches off. You must then return the throttle stick to the neutral position to restart the **iESC**. Possible causes are: faulty connection to the motor or a blocked motor.

- **Overheating guard** (beep sequence, every two seconds: BB - BB --)
  If the temperature of the **iESC** rises above 110 °C, the controller reduces power to 70 %. The motor is not switched off completely to ensure that a safe landing can be carried out.

- **Throttle signal lost** (beep sequence, every two seconds: B - B --)
  The **iESC** reduces power if the PWM signal is lost. After two seconds the motor is switched off completely. The motor runs again as soon as the signal is restored.

- **Overload guard**
  The iESC immediately switches the current off if a sudden overload situation occurs. One possible cause would be a stalled motor.

- **Low voltage** (beep sequence, every two seconds: BBB - BBB --)
  As soon as the set lower voltage threshold is reached, the **iESC** reduces power incrementally to 50 %. This gives you sufficient time to land your model safely. The telemetry facilities can also be used to set earlier alarm thresholds at the transmitter.

- **Excess current guard**
  If the Peak Current is exceeded, the **iESC** switches the motor off, then restarts the motor. If the Peak Current is exceeded a second time, the **iESC** switches off the motor completely. Possible causes include a burned-out motor.

7. SET CONTENTS

- 1x **iESC 160.CAN**
- Instruction manual in German and English

8. EU DECLARATION OF CONFORMITY

This device complies with the essential requirements and other relevant provisions of Directives 2011/65/EU + 2015/863/EU (RoHS) and 2014/30/EU (EMC). The EU Declaration of Conformity for the **PowerBox iESC 160.CAN** can be found under the following link:

www.powerbox-systems.com/en/content/certificates

9. GUARANTEE CONDITIONS

We are able to grant a **24 month guarantee** on our **PowerBox iESC** from the initial date of purchase.

The guarantee covers proven material faults, which will be corrected by us at no charge to you. The guarantee does not cover damage caused by incorrect usage, e.g. reverse polarity, excessive vibration, excessive voltage, damp, fuel, and short-circuits. The same applies to defects due to severe wear.

SERVICE ADDRESS

PowerBox-Systems GmbH
Dr.-Friedrich-Drechsler-Str. 35
86609 Donauwörth
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10. LIABILITY EXCLUSION

We are not in a position to ensure that you observe our instructions regarding installation of the **PowerBox iESC**, fullfil the recommended conditions when using the unit, or maintain the entire radio control system competently.

For this reason we deny liability for loss, damage or costs which arise due to the use or operation of the **PowerBox iESC**, or which are connected with such use in any way. Regardless of the legal arguments employed, our obligation to pay damages is limited to the invoice total of our products which were involved in the event, insofar as this is deemed legally permissible.

We wish you loads of fun with your new **PowerBox iESC**!

Donauwörth, August 2025

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