Instruction manual

ro CONTROL *PRO*

Dear customer, we are pleased that you have chosen a speed regulator for brushless motors from our product range. With the ROCONTROL series controllers, you have particularly powerful controllers for controlling your brushless motors, which can be individually adapted to your model by simple programming.

Despite the relatively simple operation of the devices, its use requires a certain amount of knowledge. You will quickly succeed in familiarising yourself with the possibilities of the speed controllers.

To achieve this goal safely and quickly, you should read the operating instructions carefully before starting up the controller.

2. SAFETY INSTRUCTIONS

General Hazard Information

Please note for all our deliveries: Please read these safety and hazard notes first, and then read through all operating and assembly instructions completely and carefully before commissioning for the first time. Remote-controlled models are not a toy and must be used by children under the age of 14 years only under the constant supervision of adults who are familiar with construction, operation, materials and potential hazards. The construction, commissioning and operation of remote-controlled models are dangerous and are the operator's responsibility. We expressly point out these dangers and assume no liability. Careful, well-considered handling during operation protects against personal injury and damage to property. Carry out maintenance and inspection of your models and electrical equipment at short, regular intervals. Regularly check that all fasteners are securely seated. Applies to all remote-controlled models:

- Make sure that nobody else in the environment uses your transmission frequency.
- switch on: Switch on the transmitter first and then switch on the receiver.
- turn off: Turn off the receiver first, then turn off the transmitter.
- Make sure that the transmitter and receiver are fully charged before starting.

In addition, please observe the following instructions:

- Do not use different types of batteries or rechargeable batteries or new and used batteries together.
- Remove dead batteries from the equipment, especially if they are not used for a long time.
- Never expose electrical equipment to dirt, dust, moisture, cold or heat. Cable damage can lead to short circuit, fire and destruction of the devices!
- Avoid injury through caution in all activities with your models.
- Check with your insurance company whether the risks arising from your models are covered by liability insurance or whether you have to insure them additionally.
- Adhesives and varnishes contain solvents that can be harmful to health. Follow the manufacturer's instructions and warnings.

Hazard warnings Flight models

Please contact experienced model pilots, clubs or flight schools for information on reducing hazards and avoiding damage. Ask all spectators to observe a safety distance of at least 5 m. Never direct your model airplane towards people, animals or high-voltage lines. Avoid public roads, pathways, squares and places where people may be present. Be considerate about the aircraft noise you're condemning.

Hazard information Controller

Make sure that you do not reverse polarity of the battery, that you avoid short-circuits of the cables, that the drive motor is effectively suppressed and that the air can circulate well. Use polarity reversal protected plug systems. All cables and connections should be well insulated. The regulator must not come into contact with grease or oil. The regulators are only intended for use in battery operated, remote controlled models. No other operation is permitted. Always perform a range test. Only use the connectors, original parts and accessories recommended by us. Do not make any changes to the controller unless stated in the description. Important: Before plugging in the controller, make sure with the other operators that if you are not using a 2.4 GHz system, your transmitter is the only one that operates on this frequency. Before you switch on the transmitter, always set the throttle lever to "Stop".

Hazard notes Motor

Motors are not suitable for persons under 14 years of age. Commissioning may only be carried out under the constant supervision of an adult who is familiar with the hazards. Before every operation, check the seat of the motor and the propeller. Never let a motor start up in the hand. Protect the motor from dirt and moisture. Do not allow foreign bodies to enter the motor. Always keep a safety distance from the rotating propeller (air screws can separate fingers!!!!!). Always maintain the maximum permissible engine and propeller speed.

Disposal of electrical appliances

Please remove all batteries and dispose of them separately. Hand in old electrically powered equipment free of charge at municipal collection points for e-waste. The remaining parts belong to the household waste. Thank you for your cooperation!

Safety information for LiPo cells and batteries
Exact data on load capacity and dimensions can be found on our homepage and in the catalogue. Information on the permanent load-bearing capacity of the cells only applies to optimum cooling. Lithium-polymer batteries (short: LiPo batteries) require particularly careful treatment. This applies to loading and unloading as well as storage and other handling. IMPORTANT! Be sure to follow the following special instructions:

- Malpractice can lead to explosion, fire, smoke and poisoning. Failure to observe the instructions and warnings will result in loss of performance and possible further defects. Only with proper storage and charging with an optimal charger can you expect the maximum service life and with 300 - 600 charging cycles you have to expect a drop in performance of only approx. 20%.

- With a non-optimal charger, the capacity is significantly reduced with every charge/discharge and thus also the service life. Storage at too high or too low temperatures may cause a gradual reduction in capacity.

General warnings - Avoid dangers!

Do not burn batteries. Never immerse the cells in liquids. Keep batteries / cells out of the reach of children. Never disassemble LiPo batteries. Disassembling a battery may cause internal short circuits. Gas generation, fire and explosion or other problems can be the result. The electrolytes and electrolyte vapours contained in the LiPo batteries are harmful to health. Avoid in any case direct contact with electrolytes. If electrolytes come into contact with skin, eyes or other parts of the body, rinse immediately with plenty of fresh water and seek medical advice.

Remove all batteries not required in the model. Always charge batteries in time. Store batteries on a non-flammable, heat-resistant and non-conductive base! Fully discharged Li-Po batteries are defective and must not be used again! If the battery is out of service, disconnect it from all loads such as speed controllers, as they always consume a little power even if they are switched off. Otherwise the battery could be destroyed by deep discharge.

Special instructions for charging LiPo batteries

Since we cannot monitor the correct charging and discharging of the cells, any warranty is excluded due to faulty charging or discharging. Only approved chargers with balancer may be used for charging Li-Po batteries. The maximum charging capacity must be limited to 1.05-times the battery capacity. Example: 700 mAh battery = 735 mAh max. charging capacity. Make sure that the number of cells and the discharge end voltage are set correctly. Observe the operating instructions of your charger/discharger. The battery to be charged must be placed on a non-flammable, heat-resistant and non-conductive base during the charging process! When charging, keep all combustible or highly flammable objects away. Batteries may only be charged and discharged under supervision. In principle, LiPo batteries connected in series may only be charged together in the pack if the voltage of the individual cells does not differ by more than 0.1 V from each other. If the deviation in the voltage of the individual cells is greater than 0.1 V, the cell voltage must be adjusted as precisely as possible by individual cell charging or discharge. Under these conditions, LiPo batteries with max. 1 C charging current may be charged. The indication 1 C charge current in mA corresponds to the capacity in mAh; i. e. 200 mA for a 200 mAh battery. Avoid a voltage of more than 4.2 V per cell in any case, as this will permanently damage the cell and may cause fire. In order to avoid overloading of individual cells in the pack, the cut-off voltage should be set to values between 3.1 V - 3.15 V per cell for a longer service life. You can also charge batteries with a lower voltage for safety and longer service life. After each charging process, check that one of the cells in the pack has a voltage of more than 4.2V. All cells must have the same voltage. If the voltage of the individual cells deviates from each other by more than 0.1 V, the cell voltage must be equalized by individual cell charging or discharge. To prevent the cells from overloading after prolonged use in packs, they should be recharged individually on a regular basis. Never charge the battery cells with incorrect polarity. If the batteries are charged with reversed polarity, there are abnormal chemical reactions and the battery becomes unusable. This can cause fractures, smoke and flames.

Special instructions for discharging LiPo batteries

A continuous current of approx. 15 C is no major problem for the LiPo batteries. For larger currents, please refer to the information in the respective product data sheets. A discharge to below 2.5 V per cell permanently damages the cells. Avoid this deep discharge unconditionally! It is essential to switch off the motor before you notice any loss of power. Then LiPo batteries would already be damaged. Therefore, leave a remaining capacity of approx. 20 % in the battery for safety reasons. If individual cells were to be fully charged differently, the regulator's low-voltage cut-off might be too late, so that individual cells could be deeply discharged. Avoid short circuits. A short circuit causes a very high current to flow which heats up the cells. This leads to electrolyte loss, gas leakage or even explosions. Due to the danger of a short circuit, avoid the proximity of conductive surfaces or contact with LiPo batteries. Permanent short-circuits lead to destruction of the battery, high temperatures and possible spontaneous ignition can be the result. The batteries must never reach temperatures above 70° C during discharge. Provide cooling or lower discharge. You can easily check the temperature with an infrared thermometer.

Stability of the battery housing foil

The foil of the aluminium housing can easily be damaged by sharp objects such as needles, knives, nails, motor connections, soldering or similar. Damage to the foil renders the battery unusable. The battery must therefore be installed in the model in such a way that the battery cannot be deformed even in the event of a crash. If the battery is short-circuited, it could burn. Temperatures above 70° C can also cause leakage of the housing. Loss of electrolyte renders the battery unusable. Add defective cells individually packed in poly bags or foil to the hazardous waste.

Mechanical shock

The LiPo batteries are not as mechanically stable as batteries in metal cases. Avoid mechanical shocks by dropping, hitting, bending, etc. Therefore, you must never cut, tear, deform or drill the laminate film. Never bend or twist LiPo batteries. Do not apply pressure to the battery or terminals.

Handling of the connections

The LiPo connectors are not as robust as other batteries. The aluminium (+) connection in particular can easily break off. Never use damaged cells: Never use damaged cells. You can identify damaged cells by one of the following methods: Damaged housing packaging, deformation of the battery cells, smell of electrolytes, leaking electrolytes. In these cases, further use of the batteries is no longer permitted. Dispose of them.

2.   INSTRUCTIONS FOR USE

Read the operating instructions carefully before commissioning the controller and follow the instructions exactly. In addition, please observe the following rules when operating a ROCONTROL controller:

- Use the controller only within the limits of the technical data, otherwise the controller could be destroyed.
- inserts that do not comply with the requirements of this manual may cause problems in operation, destroy the controller and cause injury. There are considerable hazards, damage to property and personal injury can occur.
- The flight controllers are designed exclusively for operation with rechargeable batteries. Never use the motorized door adjusters with a power supply unit!
- Protect the speed controller from vibrations, dust, moisture and mechanical stress!
- Never use a damaged regulator, e. g. due to water or mechanical deformation caused by falling or similar, in operation!
- Do not expose the controller to extreme heat or cold!
- Check the device at regular intervals for damage!
- Keep the connection cables as short as possible, especially the battery connection cables must not be extended!
- Consider the specifications of the manufacturer of the used batteries!
- The three output sockets can be connected directly to the motor connections. Ensure that no short circuits can occur, insulate everything very carefully.
- If the motor has the wrong direction of rotation, you can correct it by replacing any two motor connections. Never polish the battery connections.
- As soon as the battery is plugged into the controller, the motor can start up, extreme care must be taken. To prevent injuries, remove the propeller if you want to make adjustments to the model, for example.
- Allow the controller to cool well after each use. Make sure that there is adequate air circulation in your model, even if the model is out of service. Damage caused by overheating of the regulator excludes warranty claims.

3. FEATURES

- 32-bit ARM high-performance processor (cycle frequency 72 MHz) ensures super smooth starting behaviour, excellent engine control and compatibility with many brushless motors.

- Processor controlled DC converter for reducing possible malfunctions and loss of radio link data signals.

- DEO (Driving Efficiency Optimization) technology greatly improves response and efficiency, thereby reducing controller heating.

- Integrated high-performance BEC with stepwise adjustable output voltage (5.2 V, 6.0 V and 7.4 V). The BEC module is separated from other circuits of the controller, so that the BEC function remains intact even if other functions are disturbed. (Note: The ROCOTROL 130 A HV OPTO V5 does not have this function.

- start-up behaviour: Normal / soft / very soft for use in many propellers and EDF Jet models
- by separate programming cable possible connection of ESC to an LED programming box, for a comfortable configuration of the controller, detailed information can be found in the operating instructions of the LED programming box.
- Normal, proportional and reverse braking mode, for particularly effective deceleration of a model aircraft.(Note: The ROCOTROL 130 A HV OPTO V5 does not have this function.

- Various safety devices such as protection against tarnishing, temperature monitoring of the controller and the capacitors, overcurrent and overload protection, abnormal input voltage, protection against faulty input signal.

- HV OPTO regulator for operation with 6S to 14S LiPo batteries

4. PUT THE CONTROLLER INTO OPERATION

Attention: The controller is preset to a gas control range of 1,100 µs to 1,940 µs. The gas control path must be taught-in before the first start-up or when the transmitter is changed.

4.1 Connect controller
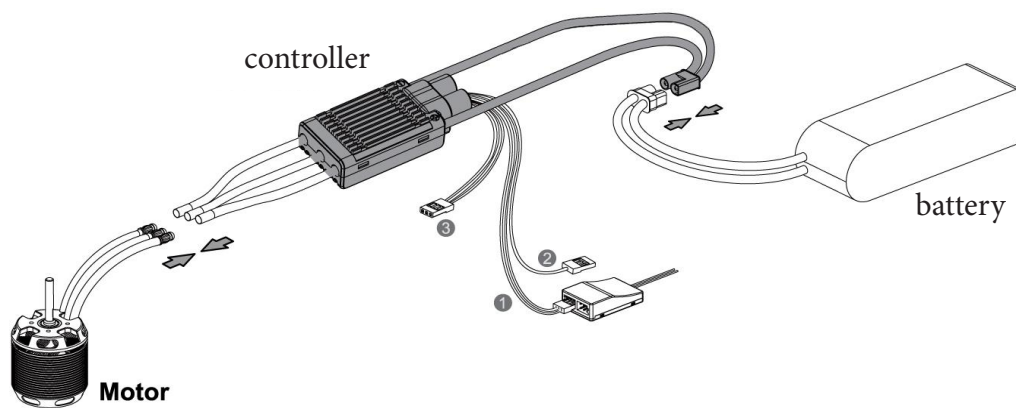
① Input signal cable (long cable white/red/black) for receiver connection

② Reverse brake signal cable (yellow cable): It must be plugged into a free channel on the receiver (when using reverse braking mode), to control the ON/OFF of the reverse braking function.

③ Programming cable (short cable white/red/black) for connection to the programming box

4.2 Connect external capacitor (optional)
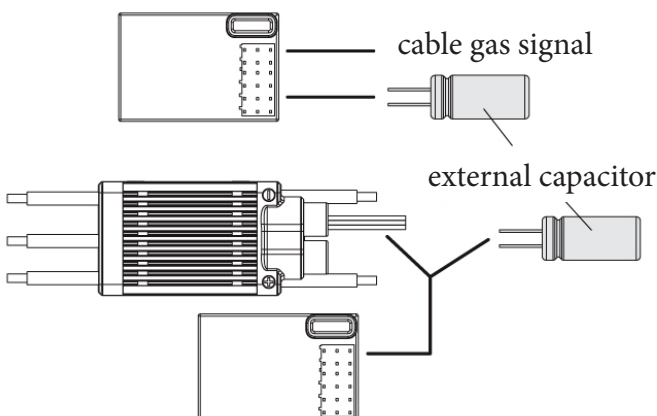
With the ROCONTROL PRO 80A controller, the BEC load can be too high when using high-performance servos. In this case, we suggest that the supply voltage is supported by an external condenser cappack connected to a free receiver output. If there is no free output, use a Y-cable on the gas channel.

Use the following method to check whether the BEC is overloaded. Move all servos quickly with fast direction changes and check if the receiver performs a reset.
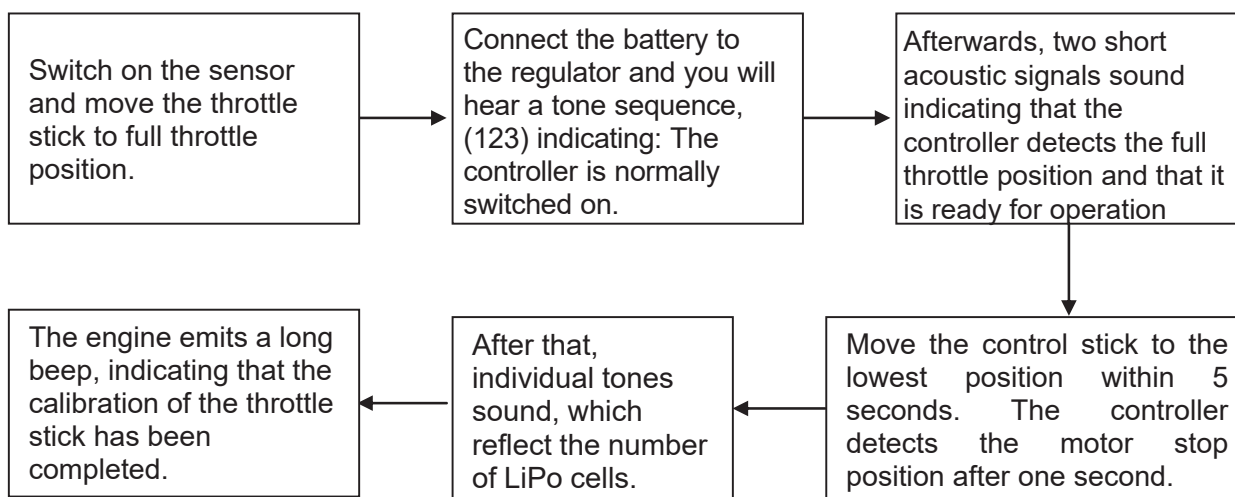
It's a sign of the shipboard voltage collapse. An external capacitor must be used.
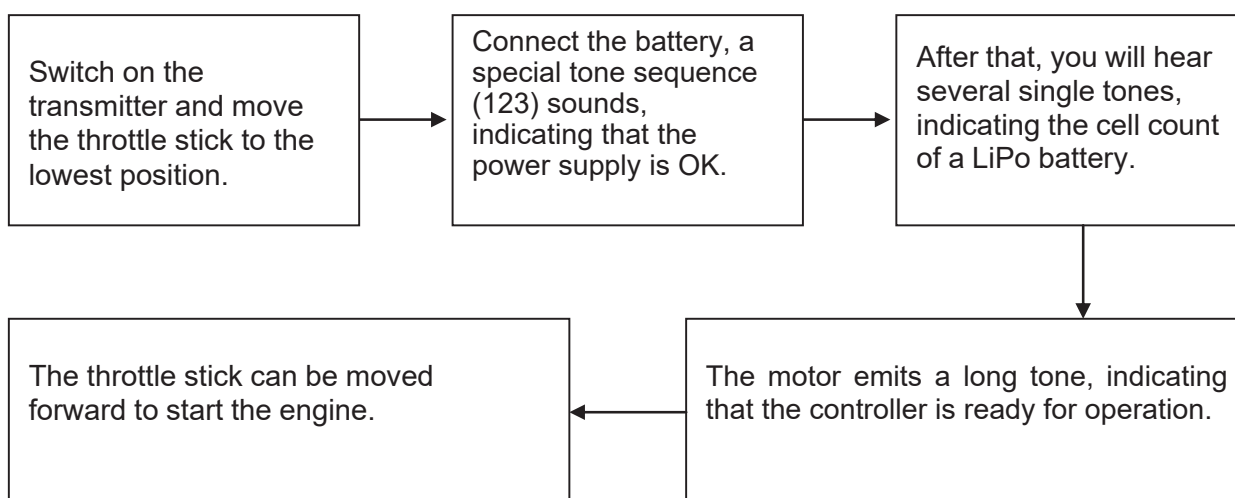
⚠ Before a test flight, carry out the procedure described above. During the test, keep the output signals from the throttle channel at 0%.

4.3   Teach-in of the gas stick path

Important note: This procedure must be carried out during the first start-up and when changing the remote control transmitter, as the different transmitters have different stick paths. To ensure smooth operation, please proceed as follows:

Switch on the sensor and move the throttle stick to full throttle position.	Connect the battery to the regulator and you will hear a tone sequence, (123) indicating: The controller is normally switched on.	Afterwards, two short acoustic signals sound indicating that the controller detects the full throttle position and that it is ready for operation
The engine emits a long beep, indicating that the calibration of the throttle stick has been completed.	After that, individual tones sound, which reflect the number of LiPo cells.	Move the control stick to the lowest position within 5 seconds. The controller detects the motor stop position after one second.

Normal commissioning

|		
Switch on the transmitter and move the throttle stick to the lowest position.	Connect the battery, a special tone sequence (123) sounds, indicating that the power supply is OK.	After that, you will hear several single tones, indicating the cell count of a LiPo battery.
The throttle stick can be moved forward to start the engine.	The motor emits a long tone, indicating that the controller is ready for operation.	

For each normal start-up, carry out the above steps carefully in the sequence shown.

5.   PROGRAMMING OF THE CONTROLLER

There are two ways to program the controller. On the one hand it can be done with the optional LED programming box. The other way is to configure the controller with the transmitter. The motor controller has many programmable parameters, so we recommend using the LED programming box.

5.1   Configuration with the optional LED programming box

controller

battery

LED programming box
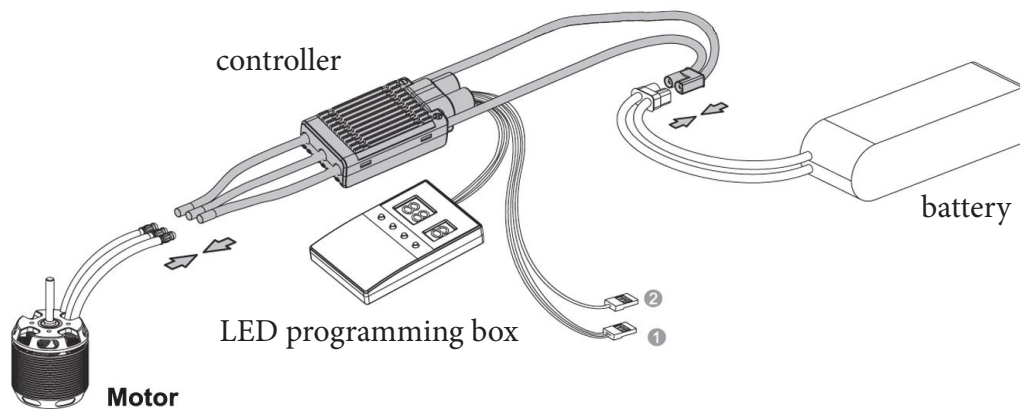
Motor

- Plug the programming cable of the motor controller into the programming connection of the LED programming box.
- If the drive battery is connected to the controller, after connecting an LED programming box to the controller, disconnect the battery first and then reconnect the controller to enter programming mode to check and set all parameters.

The portable programming box is an optional accessory for the controller configuration both in the workshop and on the airfield. The simple connection makes programming very easy and fast. Connect the drive battery to the controller after connecting the LED programming box. All programmable parameters are displayed a few seconds later. You can select and change the parameter to be programmed. To do this, use the "ITEM" and "VALUE" buttons of the programming box. Then press the "OK" button to save all new settings in the controller. **Caution**: You must switch the controller off and on again after setting the parameters. Otherwise, the new values will not take effect.

5.2   Configuration with the help of a transmitter

Connect the controller according to the normal scheme.

I.   Activating the programming mode

Turn on the transmitter, put the throttle stick in full throttle position and connect the drive battery, after 2 sec. a tone sequence will sound, after another 5 sec. a melody will be played, the controller is in programming mode.

II. Parameter Selection

After the programming mode has been activated, 12 different tones sound one after the other, which can be assigned to the individual parameters according to the following table. To select a parameter, the throttle stick must be moved to the "Motor Off" position within 3 seconds after sounding.

	Parameter	tone sequence	description
1	brake type	♪	one short tone
2	brake force	♪, ♪	two short tones
3	shutdown mode	♪, ♪, ♪	three short tones
4	LiPo cell count	♪, ♪, ♪, ♪	four short tones
5	undervoltage protection	♫♫♫	one long tone
6	BEC Voltage	♫♫♫, ♪	one long, one short tone
7	start mode	♫♫♫, ♪, ♪	one long, two short tone
8	Timing	♫♫♫, ♪, ♪, ♪	one long, three short tone
9	Motor Running direction	♫♫♫, ♪, ♪, ♪, ♪	one long, four short tone
10	Linear course	♫♫♫, ♫♫♫	two long tone
11	factory settings	♫♫♫, ♫♫♫, ♪	two long, one short tone
12	Exit programming mode	♫♫♫, ♫♫♫, ♪, ♪	two long, two short tone

III. Change selected parameters

After selecting a parameter, different tones sound in a loop that can be assigned to the individual values of a parameter. To program a certain value, move the throttle stick to full throttle position. A special tone sequence (1515) then sounds, confirming the selection and indicating that the value has been saved. The following table shows the relationships between the different values of the individual parameters and the corresponding tones. If the throttle stick remains in full throttle position, return to point II to select another parameter.

	Parameter	1 ♪	2 ♪♪	3 ♪♪♪	4 ♪♪♪♪	5 ♫♫♫	6 ♫♫♫ + ♪	7 ♫♫♫ + ♪♪	8 ♫♫♫ + ♪♪♪
1	brake type	deact-ivated	nor-mal	pro-portio.	reverse				
2	brake force	deact-ivated	stage 1	stage 2	stage 3	stage 4	stage 5	stage 5	stage 7
3	shutdown mode	soft	hard						
4	LiPo cell count	Auto-matic	3S	4S	5S	6S			
			6S	8S	10S	12S	14S		
5	undervoltage protection	deact.	2,8 V	3,0 V	3,2 V	3,4 V	3,6 V	3,8 V	
6	BEC Voltage	5,2 V	6,0V	7,4V					
7	start mode	nor-mal	soft	very soft					
8	Timing	0 °	5 °	8 °	12 °	15 °	20 °	25 °	30 °
9	Motor Running direction	right	left						
10	Linear course	on	off						

IV. Exit programming mode

Move the throttle stick to the neutral position, after 3 sec. you will hear two long tones. ♫♫, ♫♫♫) and two short tones (♪, ♪), indicating that the programming mode has been terminated. Afterwards, individual tones are displayed that reflect the number of LiPo cells in the battery. Finally, a long tone is emitted, indicating that the controller is ready for operation.

6. PROGRAMMABLE PARAMETERS

	Parameter		1	2	3	4	5	6	7	8
1	brake type		deact.	nor-mal	pro-portio.	reverse				
2	brake force		deact.	stage 1	stage 2	stage 3	stage 4	stage 5	stage 5	stage 7
3	shutdown mode		soft	hard						
4	LiPo cell count	regular	Auto-matic	3S	4S	5S	6S			
		HV		6S	8S	10S	12S	14S		
5	undervoltage protection		deact.	2,8 V	3,0 V	3,2 V	3,4 V	3,6 V	3,8 V	
6	BEC Voltage		5,2 V	6,0V	7,4V					
7	start mode		nor-mal	soft	very soft					
8	Timing		0 °	5 °	8 °	12 °	15 °	20 °	25 °	30 °
9	Motor running direction		right	left						
10	Linear course		on	off						

Notice: The various controllers of this series have partly different factory settings, please check the default settings for safety.

Explanations of the parameters

1. **Brake typ**
   Normal brake: After selecting this option, the braking function is activated when you move the throttle lever to the lower position. In this mode, the effect corresponds to the braking force you have preset.

   Proportional brake: After selecting this option, the range from 20 to 100 % of the gas control stick on the transmitter corresponds to a controller output signal of 0 to 100 %, while the encoder range from 20 % to 0 % on the transmitter corresponds to a braking force of 0 to 100 %.

   Reverse Brake: After selecting this option, the signal line for reverse operation (the signal range must be equal to that of the normal gas channel) must be connected to a free channel of the receiver. The motor direction can then be controlled via this channel. The channel range from 0 - 50 % is the standard motor direction of rotation, the channel range from 50 % to 100 % is responsible for the opposite direction of rotation. After the reverse function is activated, the motor stops first and then rotates in the reverse direction and increases the speed when the stick is moved further in the corresponding direction. A loss of signal, whether the motor is in reverse or forward operation, can lead to the signal loss protection being activated.

2. **Brake force**
   This parameter can be set in seven steps. The higher the selected level, the greater the braking effect. With the "normal brake" option, there is only one fixed level of effect.

3. **shutdown mode**
   Soft Cut Off: After selecting this option, the controller will gradually reduce the output power to 50% of full power within three seconds after the undervoltage protection is activated.
   Hard Cut Off: After selecting this option, the controller switches off the output immediately when the undervoltage protection is activated.

4. **LiPo cell count**
   With this parameter, the controller calculates the number of cells itself if the option "Auto Calc. However, the number of cells can also be set automatically.

5. **Undervoltage protection**
   This parameter is used to set the cut-off voltage, a value in the range from 2.8 V to 3.8 V can be specified. The option can also be deactivated.

6. **BEC Voltage**
   This parameter is used to specify the BEC voltage, a value of 5.2 V, 6.0 V or 7.4 V can be specified.

7. **Starting mode**
   This parameter is used to specify the start-up behavior, there are three options.
   Normal start: After selecting this option, the engine starts to turn up immediately and quickly reaches the corresponding speed by moving the throttle lever from the lower position to the upper position.
   Smooth start: After selecting this option, the engine starts turning slowly and then reaches the corresponding speed when the throttle lever is moved from the lower position to the upper position.
   Very soft start: After selecting this option, the engine is started up slowly (longer than in soft start mode) and reaches the corresponding speed when the throttle is moved from the lower position to the upper position. We recommend that you select this mode when using an aircraft with a large impeller, e. g. an EDF aircraft with a 90 Impeller or larger.

8. **Timing**
   This parameter is used to specify the timing. A value in the range of 0 degrees to 30 degrees can be specified.

9. **Motor running direction**
   This parameter is used to specify the direction of rotation of the motor, a clockwise or anti-clockwise rotation can be activated.

10. **Linear course**
    This parameter can be activated or deactivated. When activated, there is better linearity between the position of the joystick and the speed. This is the only way to ensure a correct start-up of a large impeller.

7. PROBLEM SOLUTIONS

Error	signal	possible cause	solution
The controller does not work after it has been switched on, the motor emits warning tones.	constantly three times two short tones (♫♫, ♫♫, ♫♫)	The input voltage is outside the technical specifications, it is either too high or too low.	Check the voltage of the drive battery. Make sure that it is within the controller range.
The controller does not work after it has been switched on, the motor emits warning tones.	four long tones (♫♫♫,♫♫♫, ♫♫♫,♫♫♫)	An incorrect input signal is present.	Check the sender, receiver and bindings.
The controller does not work after it has been switched on, the motor emits warning tones.	constantly four short tones (♪, ♪, ♪, ♪)	the throttle stick is not in neutral (engine off) position	Move the throttle stick to the lowest position (engine off)
The controller does not work after calibration, the engine emits warning tones.	constantly four short tones (♪, ♪, ♪, ♪)	Incorrect calibration	Perform an exact calibration procedure
The engine stuttered during the flight. It resumes normal operation as soon as the throttle stick is below 60%, but starts to stutter again when the throttle stick is above 60%. The engine emits a warning tone when the engine is stationary.	constantly two or four short tones (♫♫, ♫♫, ♫♫, ♪) or (♪♪♪♪, ♪♪♪♪)	the overtemperature protection is active	Improve air cooling for the regulator or use a fan or reduce the load.
The output power is suddenly reduced to 50 % during the flight, the engine emits warning tones after landing as long as the battery is still connected to the regulator.	constantly three short tones (♪♪♪, ♪♪♪, ♫♫♫)	the undervoltage protection is active	Insert another fully charged battery, decrease or deactivate the shutdown voltage value (not recommended)

With the help of the above table, most errors can be quickly and safely corrected. It is best to check everything carefully before commissioning.

PROTECTIVE FUNCTIONS OF THE REGULATOR

The ROCONTROL PRO controllers are equipped with several protective functions for safe operation.

1. start-up monitoring: The controller monitors the motor speed during start-up.
    If the speed does not increase any more or the speed increase is not stable, the controller will regard this as a start error. If the throttle stick is set to less than 15% at this point in time, the controller will attempt to restart automatically. If the position is greater than 20 %, you must return the throttle lever to the lowest position and then restart the regulator.

Thermal monitoring: If the temperature of the controller exceeds 110 degrees Celsius, the overheating protection is activated. For safety reasons, the power is automatically regulated back and the engine stutters. If at this point in time the throttle stick is set to less than 60 %, the "stuttering" disappears and the ESC releases the corresponding power. The engine starts to stutter again when the control stick again exceeds a position of 60%. In this state, first disconnect the battery and then reconnect it to the regulator after it has cooled down. The controller must not exceed a temperature of 70 degrees Celsius, otherwise it cannot be started. If the temperature is below this value, normal operation resumes.

Protection against signal loss: If no valid signal is received from the receiver for a period of 0.25 seconds, the power is switched off immediately to prevent even greater damage caused by high speed propellers or rotor blades. The controller works normally again as soon as valid signals are received again.

Overload protection: The controller switches off when the load suddenly rises to a very high value. It restarts automatically when the overload is gone. Possible causes of a sudden load are that the propeller is blocked or the motor and the regulator do not run synchronously. Overcurrent protection: The controller switches off immediately if the peak current exceeds the permissible value. It restarts automatically when the current value is within the specified limits. This protection ensures that, for example, an engine does not burn down.

WARRANTY

This product comes with a 24 month warranty. Our invoice serves as proof of the commencement and expiry of this warranty. Any repairs will not extend the warranty period. The statutory warranty conditions apply. For example, you may only use the product properly, but not open it. In case of warranty repair, send the product to us with a detailed description of the fault, freight forward. The addresses for an unfree shipment will be enclosed with the shipping package. For countries where freight forward is not possible we will reimburse you the postage costs

+14

This product is not a toy. Operate only under the direct supervision of adults.

Made in China

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